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Army Honors 32 Scientists, Engineers With 1966 R&D Awards

Department of the Army Research and Development Achievement Awards for 1966, recognizing outstanding results at Army in-house laboratories, will honor eight individual and seven team winners, a total of 32 persons.

Presentation of the sixth annual awards will be made in the near future by the leaders of the major commands involved. The definite dates for presentation ceremonies had not been decided at press time.

Consisting of a bronze wall plaque and a lapel pin, the awards give "recognition of technical achievements of scientists and engineers by accepted leaders" in their fields of activity.

As prescribed by Army Regulations, a recipient of an Army R&D Achievement Award must be directly responsible for a significant scientific or engineering accomplishment that:

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Dr. Lasser Succeeds Dr. Weber as Army Chief Scientist

Appointment of Dr. Marvin E. Lasser as Chief Scientist, U.S. Army, was announced in May by Chief of Research and Development Lt Gen Austin W. Betts.

Expected to report for duty about mid-June, Dr. Lasser will succeed Dr. Harold C. Weber, who has served since September 1958. As Professor Emeritus, Dr. Weber will continue his long association with Massachusetts Institute of Technology and will serve as an industrial consultant.

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Dr. Marvin E. Lasser

Merger of SMC With AMC Announced Effective July 1

Headquarters of the Army Supply and Maintenance Command will be merged with Headquarters of the Army Materiel Command, effective July 1, with the AMC assuming direct control of field installations and activities formerly under the SMC.

General Frank S. Besson, Jr., CG of the AMC, announced that the merger is the result of continuing studies to insure maximum efficiency, economy and effectiveness.

He said it will "clarify command responsibilities, expedite the decision-making process, and provide a more cohesive and responsive organization with sharper focus on the develop-

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First Floating Nuclear Plant Undergoes Testing at Belvoir

Nuclear power plant development by the Army Corps of Engineers, responsible for the first military stationary plant in the U.S. (1957), and the first air-transportable plant (1961), is entering a new phase with testing of a 10,000-kilowatt floating plant.

First of its kind in the world, and capable of supplying electricity to a community of 10,000 to 20,000 population, the MH–1A plant was constructed under a $17.2 million contract. It is housed in a converted World War II Liberty Ship.

Intended for remote area military operations or emergencies, the MH–1A plant can be used for disaster relief to communities near ocean ports or along navigable waterways. Docked now at Fort Belvoir, Va., where testing is expected to begin early in July, the plant was towed in 7½ days from Mobile, Ala. It was constructed by the Martin-Marietta Corp.

The Liberty Ship, formerly the *SS Charles S. Cugle*, is named in honor of the deceased former Chief of Engineers, Lt Gen Samuel D. Sturgis, Jr. The *Sturgis* is a towed vessel because self-propulsion machinery is consid-

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Brig Gen Paul Becomes Plans Director for CRD

Brig Gen Thurston T. Paul took office May 2 as Director of Plans and Programs, Office of the Chief of Research and Development (OCRD), succeeding Brig Gen Raymond B. Marlin, who had served in that post since July 1963.

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Brig Gen Thurston T. Paul

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Army R&D Newsmagazine

Vol. 7, No. 6 June 1966

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President Lauds 130 Students at 4th National JSHS

President Lyndon B. Johnson's telegram message to some 130 of the Nation's brightest science students participating in the fourth National Junior Science and Humanities Symposium, May 5–7, termed them "leaders of tomorrow's America."

Sponsored by the Office of the Chief of Research and Development, with CRD Lt Gen Austin W. Betts making one of the major addresses, the meeting opened at Headquarters of the Army Electronics Command, Fort Monmouth, N.J., and moved to Princeton University for second-day sessions.

The Chief Executive's message, read by ECOM Commander Brig Gen William B. Latta, stated in part:

"The Junior Science and Humanities Symposium Program gives me the privilege of expressing my admiration for those young Americans who have shown exceptional ability, particularly in the sciences. Meaningful frontiers of progress have been crossed in the recent history of education. But our task has only begun.

"The goal of those who came before us must be constantly revitalized and horizons of the past must be broadened. As leaders of tomorrow's America, it is well that you recognize today the responsibilities which the future holds. It is heartening to know your appreciation of the great value provided by education—and it is heartening to see that you are making the most of the wonderful opportunity before you. . . ."

General Betts used examples of Army research and development programs and end-products to illustrate the interlocking of scientific disciplines in the military and civilian scientific communities. Outlining the progress of important inventions such as radar and the Laser, he said:

"The historical process of invention, growth and breakaway to new knowledge is characteristic of all dynamic systems. You young people are part of this remarkable process. Without question, you will be playing your own personal roles in your fields of interest in the not too distant future."

In speaking of the Army's leading role in pioneering radar and electronics, including space communications, General Betts singled out for high praise Dr. Harold A. Zahl, retired Director of Research in the former ECOM Laboratories. Dr. Zahl, a guest at the symposium, was cited for his foresight in recognizing important scientific advances and aiding their support with Army funds.

Director of Army Research Col Robert E. Kimball was among the many dignitaries who participated in the symposium, including leading executives and scientists of several universities. Col Kimball expressed his appreciation to the cohosts, the ECOM and Princeton University, and commented on the stimulating and challenging viewpoints presented at the National Junior Science and Humanities Symposium.

Dr. Henry Morganau, Yale University professor of physics and natural history, first-day banquet speaker, pointed out that modern science is questioning the "absolute truths" accepted by scientists in the last century. New scientific and philosophical thought, starting with Einstein and the theory of relativity, he said, "may not disprove the axioms of the past but . . . the absolute, inflexible truth has been removed from science."

Dr. George R. Seidel, educational manager, E. I. du Pont de Nemours & Co., presided at the opening ceremonies, at which Dr. Henry Eyring, Dean of the Graduate School at the University of Utah, was a principal speaker.

When the symposium moved to Princeton University, Dean Harry L. Levy of City University of New York was the dinner speaker. Other leading speakers included Dr. James H. Billington, Princeton professor of history, and Dr. Thomas R. Carver, professor of physics.

Second-day sessions included a series of small discussion groups with Princeton professors in the sciences and humanities. Known as preceptorials, these sessions were originated by Woodrow Wilson when he was president of the university.

Students participating in the symposium were selected for presenting outstanding papers at 22 regional Junior Science and Humanities Symposia during the past year. Twenty-five selected students from junior science fairs sponsored by the U.S. Department of Health, Education and Welfare also attended. Directors of regional JSHS and outstanding science teachers participated in the sessions.

While at Fort Monmouth, students were taken on tours of the Electronics Command laboratories, the Satellite Communications Agency and the Army Signal Center and School.

Army Honors 32 Scientists, Engineers With 1966 R&D Awards

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- Establishes a scientific basis for subsequent technical improvement of military importance and/or
- Materially improves the Army's technical capability and/or
- Contributes materially to national welfare.

Work recognized by the 1966 awards reflects the diversity and depth of the Army in-house laboratories research and development activities, currently conducted at more than 50 installations and involving about 7,800 scientists and engineers. The total of work units is about 7,000, and reaches into most of the subfields of major scientific disciplines.

Among research and development achievements upon which the 1966 award winners were selected are many new items of materiel now in use in Viet Nam, produced on a greatly accelerated basis to meet urgent needs. Examples include aircraft protective armor, greatly increased aircraft firepower, and a detector to indicate direction and intensity of antiaircraft fire.

Other R&D Award achievements include a low-cost battery for artillery fuzes, studies on the structure and stability of chelate complexes of titanium, a hydrazine-air fuel cell to generate power for special requirements of jungle warfare, avionics studies leading to a man-machine simulator (TASS), and explosives protection research.

Unique aircraft countermeasures munition, studies of diseases of the human nervous system, advances in nondestructive testing of materials, progress in photomapping research, missile propellant research exploiting use of atmospheric pressure, and geodetic studies of significant importance also are credited to award winners.

Winners were selected from a list of 27 nominations by an ad hoc committee comprised of civilian scientists, representative of the Life, Physical, Environmental and Social Sciences Divisions of the Army Research Office, and staff officers of the Missiles and Space and the Development Directorates, Office of Chief of Research and Development.

Nominations were first screened thoroughly within the major commands to narrow the field. This process resulted in the Army Materiel Command, which controls nearly 90 percent of Army in-house laboratories, reducing its list of nominees to 19.

The Office of The Surgeon General, the Office of the Chief of Engineers, and the U.S. Army Limited War Laboratory each entered two names. One nomination each came from the Army Research Office — Durham (N.C.) and the Army Personnel Research Office.

The 1966 Army R&D Achievement Award winners and the work upon which their selection is based are:

ALLAN M. BIGGAR, Harry Diamond Laboratories (HDL), Washington, D.C. Employed as a GS–13 research engineer, he conceived, designed, developed and evaluated a low-cost battery for artillery fuzes. This achievement contributes significantly to the technology of ammunition power supplies.

Expected to achieve major savings in procurement costs in the U.S. Military program, the battery was produced in an accelerated time frame in response to a priority demand.

MAURICE CODELL, Pitman-Dunn Research Laboratories, Frankford Arsenal, Philadelphia, Pa. While working during a one-year Secretary of the Army Research and Study Fellowship at the University of Tokyo, Japan, in 1963–64, he initiated studies he completed in 1965 on the

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Dr. Lasser Succeeds Weber as Army Chief Scientist

(Continued from page 1)

Dr. Lasser will advise General Betts on overall management of the Army R&D Program. He will specialize in long-range technological forecasting and in evaluating the latest scientific developments on both a national and international basis to determine advances of Army interest.

Based upon evaluations, Dr. Lasser will recommend areas of endeavor to be stressed and changes in priorities necessary to keep the Army R&D Program abreast of technology.

He will be an ex-officio member of the Army Scientific Advisory Panel (ASAP) — the senior scientific advisers to the Secretary of the Army, the Army Chief of Staff, the Assistant Secretary of the Army (R&D) and the Chief of Research and Development.

Associated with the Philco Corp. since 1954, he has been serving as director of the Applied Research Laboratory, Philadelphia, Pa. Under his direction the Laboratory has been oriented to research that leads either to new products and systems or to the improvement of existing areas.

Dr. Lasser received a BA degree (1949) from Brooklyn (N.Y.) College and an MS (1951) and PhD in physics (1954) from Syracuse (N.Y.) University. He held teaching assistantships and research associate positions while he attended Syracuse.

Author of a significant number of scientific papers, he is a Fellow of the American Physical Society and has been active on a number of committees performing services in the field of physics. He was on both the Planning and Editorial Committees of the recent International Photoconductivity Conference held at Cornell University. He also has been serving as a consultant with the National Aeronautics and Space Administration and Army Electronics Command.

Army Reserve R&D Unit Plans Oak Ridge Seminar

Chief of Research and Development Lt Gen Austin W. Betts has approved holding the sixth Army Nuclear Sciences Seminar at the Oak Ridge National Laboratories, July 10–23.

Sponsored by the 3252nd R&D Unit of the Army Reserves, this is the only Army-sponsored seminar in the nuclear science field. It is open for the first time this year to Reserve officers of all components of the Armed Forces having scientific or technical backgrounds.

Seminar Director Col David F. Cope, CO of the 3252nd, said that revision of prerequisites for admission to the seminar was made "to broaden the opportunity for technically qualified Reservists to attend."

A number of Reservists throughout the country have strong technical backgrounds but are not associated with a research and development unit. Col Cope said that training in atomic energy would aid many Reservists in their present scientific assignments.

A quota of 80 Reserve officers has been established for the seminar. Col Cope expects the quota to be filled, and said this number could be "stretched" if more officers apply.

The 2-week active-duty-for-training course will include nuclear reactor development, construction and application; nuclear fuel recycle; radioactive waste disposal; biological effects of radiation; thermonuclear power; tactical application of nuclear weapons; orientation lectures on the basic sciences and tours of the Atomic Energy Commission facilities.

Brig Gen Paul Becomes Plans Director for CRD

(Continued from page 1)

Until he assumed his new duties General Paul was Assistant Deputy Chief of Staff for Logistics (Materiel Readiness), Department of the Army. General Marlin has been reassigned to the U.S. Army Element, Joint Military Advisory Group Korea/Provisional, reporting in July.

Before joining OCRD, General Marlin was Chief of Staff, Army Infantry Center, Fort Benning, Ga., for two years. From June 1960 to May 1961 he was Deputy Comptroller, Comptroller Division, U.S. Army Europe and before that deputy brigade commander, Third Infantry Division, USAREUR, from December 1958 to May 1960.

General Marlin was graduated from the U.S. Military Academy in 1939 and was a battalion commander, 23rd Infantry, during World War II.

Among other awards, he holds the Distinguished Service Cross, Silver Star, Legion of Merit and the Bronze Star with Oak Leaf Cluster.

GENERAL PAUL served on the headquarters staff of the Army Ballistic Missile Agency (ABMA) in 1956 at Redstone Arsenal, Ala., and has had a number of key responsibilities concerned with missile development.

Most recently, he has been chairman of a Department of the Army committee studying the logistic support of low-density, high-cost missile systems which are termed "operationally of extreme importance to the military posture."

With the ABMA he was, progressively, director of support operations, deputy commander and commander, serving until June 1960. During this period the stature of Army missilry was growing with the Jupiter and Pershing developmental programs and General Paul was active in the management of both.

Accomplishments during his tenure included the launching of the Free World's first successful earth satellite (Explorer I, Jan. 31, 1958) and lunar probe (Pioneer IV, Mar. 3, 1959), and the first space flight of two monkeys in the nosecone of a Jupiter missile in May 1959.

General Paul also participated in the first phases of the Mercury Redstone Program and the inception of the Saturn Program. He coordinated ABMA actions when the Army space effort was transferred to the National Aeronautics and Space Administration (NASA) in June 1960. General Paul attended the National War College, graduating in 1961.

Assignment to the Office of the Deputy Chief of Staff (Logistics) as assistant director, Plans and Materiel, was followed by 14 months as chief of staff, in the newly organized Army Supply and Maintenance Command. Then he was on the J4 staff of the Commander-in-Chief Pacific in Hawaii and later in command of the Army Logistical Center Japan. He was promoted to brigadier general Aug. 1, 1965, upon return to the U.S.

General Paul's interest in military service began with the New York National Guard in 1928 at age 14. He spent pre-enlistment years attending drills and summer camp as a radio operator. He enlisted in the Guard in February 1933, was commissioned a 2nd lieutenant, Infantry, in 1936 and was called to active duty in October 1940 as an Infantry captain. For five years he had been a New York State school teacher and principal.

General Paul served with the 27th Infantry Division, attended the Command and General Staff College (G–3 course) and in late 1943 went to England with the VII Corps Headquarters to help develop plans for the invasion of France and to conduct training exercises.

He landed at Utah Beach at Normandy June 7, 1944 with Task Force Uncle and remained with VII Corps through five campaigns in Europe to the final occupation of Germany.

A native of Rensselaer, N.Y., General Paul received an AB degree from New York State College for Teachers, Albany (1935) and completed requirements for an MA in education in 1947. He attended the University of Illinois under the Army civilian schooling program and earned an MS degree in electrical engineering in 1948.

He has been awarded the Legion of Merit, the Bronze Star Medal, the Army Commendation Medal with three Oak Leaf Clusters and the Air Force Commendation Medal.

Col Harvey Named USACDC Evaluation Director

Col Ben Harvey, Jr., assumed duties as director, Evaluation Directorate, U.S. Army Combat Developments Command (USACDC), Fort Belvoir, Va., when Col William H. Vail, Jr., departed recently for assignment as deputy commander, U.S. Army Air Defense Center, Fort Bliss, Tex.

Col Harvey has been chief of the Field Experimentation and Troop Test Division, Evaluation Directorate, since 1965, following graduation from the National War College. From 1962 to 1964 he was chief, Military Engineering Division, Office of the Chief of Engineers, Washington, D.C.

Commissioned in 1940 in the Field Artillery, U.S. Army Reserve, from the Virginia Military Institute, Lexington, Va., Col Harvey holds a BS degree in civil engineering. He is also a graduate of the Command and General Staff College, Armed Forces Staff College and the Air War College.

Col Ben Harvey, Jr.

Among his decorations and awards are the Silver Star and Bronze Star, Distinguished Unit Citation, Meritorious Unit Commendation, and the Army Commendation Ribbon.

COL VAIL, prior to joining the USACDC Evaluation Directorate, served a 3-year tour in Europe as senior liaison officer, Northern Army Group and British Army on the Rhine. From 1957–59 he was assistant chief of staff, G4, U.S. Army Air Defense Center, Fort Bliss, and then he served as director of Logistical Support at North American Air Defense Command Headquarters, Colorado Springs, Colo.

Col Vail, a 1938 graduate of the U.S. Military Academy, spent 1946–50 at West Point as an instructor, assistant professor and associate professor in the Department of Mechanics. Then he served a tour in the Office of the Deputy Chief of Staff for Operations, Washington, D.C.

During World War II, he spent four years in the Pacific area, ending with the Southern Philippine and the Ryukyu campaigns. His awards include the Asia-Pacific, American Defense, World War II Victory and National Defense Service Medals. He also holds the Bronze Star and the Army Commendation Ribbon.

Former SA Presents 1966 Pace Awards to Townsley, Gilbert

Former Secretary of the Army Frank Pace presented the 1966 Pace Awards May 20 to Lt Col Edwin S. Townsley, Office of the Chief of Research and Development, and John L. Gilbert, Office of the Deputy Chief of Staff for Logistics.

Since the awards were initiated in 1963 to honor the former Secretary of the Army, at least one of the winners each year has been representative of Army research and development.

Lt Col Charles J. LeVan, known for his Nike X and Nike Zeus work while assigned to OCRD, was a 1963 winner, along with Joseph A. Beauregard, Office of the Chief Signal Officer. Maj Charles K. Heiden of OCRD was a 1964 winner for his work on the Main Battle Tank 1970s project.

Recipients in 1965 were Lt Col Joseph P. Cribbens, Office Deputy Chief of Staff for Logistics, and Lewis H. Blakey, Sr., Office of the Chief of Engineers.

The purpose of the Pace Awards is to give special recognition to a civilian employee (GS–14 or below) and a military officer at Headquarters, Department of the Army, for a contribution of outstanding significance to the Army during the calendar year. The award honors individual efforts rather than work as head of a unit.

Lt Col Townsley's citation covers a wide range of achievements as a staff officer in the OCRD Combat Materiel Division from July 10, 1964 to Dec. 31, 1965. During this period he was recognized for "extremely able staff monitorship and supervision of a large number of Engineer and Quartermaster projects."

FORMER SECRETARY of the Army Frank Pace, Jr., presents award named in his honor to Lt Col Edwin S. Townsley, military recipient of 1966.

Principally, however, he was commended for his early recognition of the importance of the Army's night-vision R&D program to provide a capability for military operations under the cover of darkness. He initiated a review of activities and recommended changes that strengthened the program.

Lt Col Townsley's "efforts contributed greatly to expediting completion of development and early procurement of first-generation image intensifier equipment, a new system of instruments which promises to provide a significant advance in the Army's night operational capability. These items have proved successful in initial employment in Viet Nam."

Under his "careful yet imaginative guidance, work on a second-generation family of such devices has progressed in a most commendable manner," the citation continues, "promising even greater benefits to the Army.

"His outstanding professional and technical skills as an Army officer, a professional engineer, and as a program supervisor have been recognized by all those who have had the pleasure to work with him. His extremely meritorius performance has inspired confidence and respect and reflected great credit to himself and the U.S. Army."

Graduated from the U.S. Military Academy in 1949 with a BS degree in military engineering, he later earned a master of public administration degree from Harvard University. In 1957 he rceeived an MS degree in structural dynamics and in 1959 was awarded a PhD in civil engineering, both from the University of Illinois.

Wounded in action with a Combat Engineer company in Korea, he served as military assistant to the director, U.S. Army Waterways Experiment Station, Vicksburg, Miss., from 1957 to 1959 and was assistant plans officer in the engineer section with the Seventh U.S. Army from 1961 to 1963.

Upon completion of the Command and General Staff College course in 1964, he was assigned as chief, General Materiel Branch, Combat Materiel Division, Office of the Chief of Research and Development.

ASAP to Hear Viet Nam Veterans at Benning Meet

Presentations by veterans of Viet Nam action, a demonstration of night defense by a combined arms team, and a Viet Nam village problem will highlight the June 21–22 meeting of the Army Scientific Advisory Panel at Fort Benning, Ga.

The ASAP program is designed to assist a newly established ad hoc group in reviewing technological support and to bring the entire Panel abreast of the Viet Nam situation through comprehensive background briefings and discussions.

Maj Gen Robert H. York, commanding general of the Fort Benning Infantry Center, is the host and Brig Gen Ellis W. Williamson is the featured speaker. Recently returned from Viet Nam, he will discuss the current situation in an effort to bring the scientific community closer to the problems.

Dr. Jacob E. Goldman, ASAP member and director of the Ford Motor Co. Engineer and Research staff, is chairman of the ad hoc group formed in April by Assistant Secretary of the Army (R&D) Willis M. Hawkins. Dr. Goldman will discuss the group's future plans and objectives after gathering first-hand accounts from individuals just returned from Viet Nam.

More than 80 ASAP members and consultants, Army staff representatives and dignitaries associated with R&D are expected to attend. The June meeting is one of three scheduled each year and it is the only one that both ASAP members (22) and consultants (41) attend.

Panel members assemble annually in February and October. The meetings are usually held at military installations where ASAP personnel are brought up to date on subjects of current interest to the Army's Research and Development Program.

Army Studies Precise Control of Laser Beam To Provide High-Speed Computer Printouts

Precise control of a Laser's intense coherent light to position a beam to any of 131,072 points, within a space smaller than a match head and at speeds exceeding 100,000 selections per second, is under Army study for high-speed computer printouts.

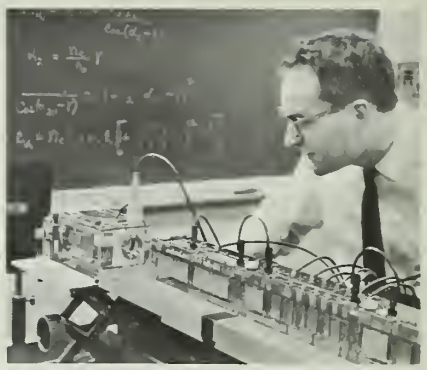
Presently in exploratory development at the U.S. Army Electronics Command, Fort Monmouth, N.J., the experimental equipment was produced under contract by the Systems Development Division of International Business Machines Corp. ECOM scientists contributed to the research and guided the contract.

Considering its potential to store data, provide printed readouts, and project images, ECOM scientists envision a system in which such "inputs" as typed material, charts and line drawings could be fed into a computer. Relayed hundreds of miles by radio to another computer, they could be processed and reproduced instantly as printed pages or as greatly enlarged screen displays.

In the data-storage process, vast amounts of information could be put into optical computer "memories" by using such photosensitive material as film, instead of the widely used magnetic cores.

To provide a readout in printed form, the Laser beam can scan through a mask inscribed with the alphabet and other symbols and—through the action of light-bending (deflection) crystals—turn out the final product on photosensitive pages. By using such a light-wave method, instead of moving type bars, computer printers can be made smaller, faster and more reliable.

For screen displays, the Laser system, which produces much brighter images than conventional projector equipment, could be used in a normally illuminated room. This, as one example, would be valuable for military command and control centers, inasmuch as displays of fast-changing tactical movements and other situations could be followed without disrupting other operations by darkening the room.



IBM PHYSICIST Dr. Millard A. Habegger tests new light-deflector system that can position a beam to any of 131,072 points at 100,000 per sec.

ECOM and IBM researchers point out that the new system can be used with any light source, but the Laser beam is employed because of its extreme brightness.

ECOM's experiments with the equipment are being carried out by the Display Techniques Team of the Communications and Automatic Data Processing Laboratory headed by Col George M. Snead, Jr. Pierce Siglin is team leader and Erich F. Kral, project engineer.

Gillis, Egghart, Hoeschen Win 1966 ERDL Awards

Engineer Research and Development Laboratories Commanding Officer's Award winners for 1966 are Edward A. Gillis for work on a fuel-cell power source for use in Viet Nam, Dr. Heinrich Egghart for research on metastable compounds, and Jerome W. Hoeschen for scientific leadership.

Presented at an outdoor ceremony May 20 at Fort Belvoir, Va., the ninth annual awards honored outstanding technological, scientific and leadership achievements. Dr. Jay Tol Thomas, Director of Research and Laboratories, Army Materiel Command, was the guest speaker.

Maj Gen William C. Gribble, Jr., Deputy Chief of Research and Development, Department of the Army, presented the plaque-mounted medal for technological achievement to Gillis, also a 1966 Department of the Army Research and Development Achievement Award winner.

Dr. Robert M. Page, Director of Research, U.S. Naval Research Laboratory, presented the scientific medal to Dr. Egghart. Col Frank Milner, commander of the Laboratories, made the leadership award to Hoeschen.

Dr. George W. Howard, Engineer R&D Laboratories Technical Director, presented each of the 11 candidates for the awards with a certificate and a $50 cash prize. The nominees and the basis of selection were announced in this publication last month.

EDWARD GILLIS—the citation accompanying the award states, "achieved fuel-cell power density, efficiency and performance levels which exceed any known U.S. or Free World technological achievements in the fuel-cell field of endeavor." As a result, the Engineer R&D Laboratories were able to "satisfy urgent and sensitive user needs for silent electrical power sources that heretofore could not be met by any other means."

DR. EGGHART—in his studies of the processes occurring in decomposition and explosion of metastable compounds, was cited as "the first to discover the importance of the electronic factor of catalysis in these processes. . . . He developed a method of preparing explosive azides in molten salt media, which permits the preparation of thermally more stable azides. This result is of practical and scientific importance. He also was the first to study the thermal stabilities of azide complexes in molten salt media. . . ."

JEROME HOESCHEN was cited for "superior management of the Design Proof Branch during 1965 while prosecuting a greatly expanded program to meet Southeast Asia and other urgent requirements. By the judicious use of his own personnel, close scheduling of personnel, test equipment and facilities, and exceptionally fine coordination with project engineers and supervisory personnel of other branches of the Laboratories, he successfully completed an excessively stringent program involving the test and evaluation of heavy earth-moving, construction, materials handling and other types of vehicular equipment. . . ."

ARPA Appoints Dr. Lukasik As Nuclear Detection Director

Dr. Stephen J. Lukasik recently was appointed director of Nuclear Test Detection for the Advanced Research Projects Agency (ARPA), Department of Defense.

Formerly with the Stevens Institute of Technology, Hoboken, N.J., he is responsible for ARPA research to solve problems concerning the detection of nuclear detonations in space, the atmosphere, underground and under water. Dr. Robert A. Frosch, deputy director of ARPA, has headed this program as an added responsibility.

Dr. Lukasik was director of the Computer Center and research associate professor of physics at Stevens Institute. From 1955 to 1957, he was a nuclear reactor physics scientist with the Westinghouse Electric Corp. He received a BS degree from Rensselaer Polytechnic Institute in 1951, MA (1953) and a doctorate (1956) in physics from MIT.

First Floating Nuclear Plant Undergoes Testing at Fort Belvoir

(Continued from page 1)

ered uneconomical for a craft that will be in one port or another most of its life.

The MH–1A nuclear power plant in the *Sturgis* is similar to the plant which propels the nuclear ship *Savannah*. All of its power, however, will be used to generate electricity for off-shore requirements.

When finally accepted by the Army —after an estimated six months of testing by the construction contractor —the MH–1A will be under the Nuclear Power Field Office (NPFO), an element of the Army Corps of Engineers, for operation and further tests.

At Fort Belvoir, the MH–1A will be operating within a few hundred yards (at Whitestone Point on the Potomac River) of the first military stationary plant, the 2,000-kilowatt SM–1. Since 1957 the SM–1 has been operated by the NPFO as an electrical power source and for training nuclear power operators.

BOW OF *STURGIS*, showing exterior of MH–1A nuclear power plant, docked at Fort Belvoir, Va. The 10,000-kilowatt plant is capable of supplying electricity to a community of 10,000 to 20,000 population for use in emergencies.

Including the special 212-foot midsection, the *Sturgis* is 441 feet from stem to stern. The reactor is enclosed by concrete, lead and polyethylene shielding to prevent escape of radioactive particles.

A military crew of 48 men will be required to operate the MH–1A plant and the vessel. On a 24-hour basis, the crew will work in three shifts of 12 men each with a relief crew of 12. Those of the crew who man the reactor will be NPFO-trained.

The fuel in the reactor core will be uranium dioxide enriched with U–235. When the reactor goes "critical," primary water in the generating plant will be heated to 490° F. Secondary water in a stream generator will then be heated to drive the electrical turbine. Electricity will be delivered at either 50 or 60 cycles.

The MH–1A power plant is a major milestone in the Army Nuclear Power Program which was started in the mid-1950s. The SM–1 was completed and became operational in 1957. The SM–1A, sister plant to the Belvoir facility, has been operating at Fort Greely, Alaska, since March 1962. The design contract for the MH–1A was let in August 1961 and construction began in February 1963.

The reactor in the *Sturgis* is protected from collision by a 112-foot barrier on either side of the hull to prevent penetration to no less than 12 inches from the reactor's containment vessel. Other elaborate safety features have been built into the MH–1A system to provide maximum protection against any possibility of nuclear contamination of the operating crew or residents where it is used.

Lawrence Memorial Award Honors ASAP Chairman

Army Scientific Advisory Panel Chairman Dr. Harold M. Agnew is one of five U.S. scientists honored recently with the Ernest Orlando Lawrence Memorial Award for 1966, consisting of a medal and $5,000.

Presented by the U.S. Atomic Energy Commission, upon recommendation of its General Advisory Committee and with approval of the President of the United States, the Lawrence Memorial Award recognizes achievements in nuclear science and technology.

Dr. Agnew, Weapons Division leader at the Los Alamos (N. Mex.) Scientific Laboratory, was cited for his "highly significant contributions to the development of nuclear weapons, and for his outstanding success in working with the Armed Services to assure the maximum safety and effectiveness of atomic weapon systems."

Other 1966 recipients are : Murray Gellmann, professor of physics, California Institute of Technology; John R. Hizenga, senior scientist, Argonne National Laboratory; Paul R. Vanstrum, member of the technical management staff, Oak Ridge (Tenn.) Gaseous Diffusion Plant; and Ernest C. Anderson, member of the biophysics staff of the Los Alamos Lab.

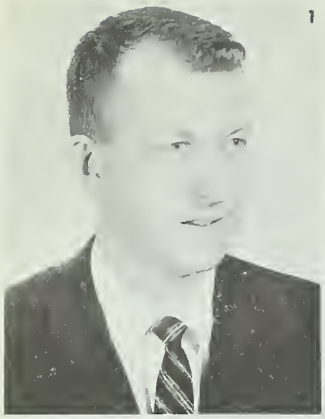
Dr. Agnew served with the Manhattan District, University of California, Los Alamos, from 1942 to 1946 and was a National Research Fellow, University of Chicago, from 1946 to 1949.

After progressing up the career ladder at the Los Alamos Laboratory, he took leave from 1961 to 1964 to become scientific adviser to the Supreme Allied Commander, Europe. Upon his return to Los Alamos in 1964, he was named head of the Weapons Division and also was appointed to the Army Scientific Advisory Panel. He was appointed to the President's Science Advisory Committee in 1965 and has served on the U.S. Air Force Scientific Advisory Board since 1957.

Dr. Harold M. Agnew

Army Announces 15 Selections For R&D Achievement Awards

(Continued from page 3)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structure and stability of chelate complexes of titanium, using electron paramagnetic resonance spectrometry.

Through an analysis of EPR line shapes, relative signal intensities, microwave power saturation and spectroscopic splitting factors, the GS–13 chemist demonstrated that various major complexes exist in aqueous solutions of chelate complexes where it was previously thought that only one principal species existed.

2

MILTON CUTLER, U.S. Army Limited War Laboratory, Aberdeen Proving Ground, Md. In his capacity as GS–16 chief of the Advanced Development Division, he contributed to the effectiveness of quick-reaction research and development in providing new devices or materiel for delivery to Southeast Asia through planning, supervision and direct technical creativity.

Accomplishments to his credit include the Man-Pack Personnel Detector (Chemical), the Acoustic Bullet Detector for low-flying aircraft, the Integral Smoke Generator, the Chemiluminescent Panel, a Position Locator, a Runway Marking System, Lightweight Water Purification Unit, and Ultrasonic Sniffer for ambush detection.

3

EDWARD A. GILLIS, U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va. As a GS–13 project engineer in the Advanced Power Sources Branch of the Electrical Power Division, he responded to an emergency power source development requirement for jungle warfare in Southeast Asia.

Gillis conducted advanced engineering design and development of a greatly improved hydrazine-air fuel cell, incorporating major gains in power density, simplicity, efficiency and economy. The end product provided the U.S. Army with an otherwise unobtainable 5-kilowatt silent-power source.

4

5

WILLIAM J. KENNEALLY, U.S. Army Avionics Laboratory, Fort Monmouth, N.J. As a GS–13 leader of an Avionics Systems Engineering Team, he conceived, established system requirements, determined system design approaches and goals, integrated and checked out a large-scale man-machine simulator.

TASS will be used in the design of automatic flight control, terrain avoidance and formation flight, systems for existing aircraft (Mohawk, UH–1, CH–47 and others) to provide the Army with the most cost-effective avionic subsystems and systems.

6

7

CHARLES KNAPP, Pyrotechnics Laboratory, Picatinny Arsenal, Dover, N.J. Working on a high-priority project as a GS–13 supervisory chemist, he was responsible for research leading to advanced infrared producing pyrotechnic formulations; and for conceiving and applying these to the successful design, development and fielding of a unique aircraft countermeasure munition which has materially increased the military potential of the U.S. Armed Forces.

DR. PETER W. LAMPERT, Armed Forces Institute of Pathology, Washington, D.C. As chief of the Experimental Neuropathology Section, Department of Pathology, Dr. Lampert conducted studies that have resulted in major contributions to understanding of demyelination as a result of diseases affecting the nervous system, and to factors promoting remyelination and repair of the damaged muclin.

8

Dr. Lampert is continuing his research in this area in

collaboration with Dr. Marian Kies at the National Institutes of Health, Washington, D.C. The research is basic to understanding of damage to the myelin sheath from the allergic mechanism; it has thrown light upon the general reaction of the myelin sheath to injury from noxious agents.

DR. LEON W. SAFFIAN, Process Engineering Laboratory, Picatinny Arsenal. Achievements for which he is recognized as a 1966 award winner are reported in six technical reports totaling over 250 printed pages.

The citation resume states that he "advanced the technology of design of protective structures for resisting the damaging effects of explosions and minimizing explosion propagation—increasing safety and optimizing capabilities for manufacture and storage of explosives, munitions and other explosively hazardous materials."

EDWARD R. BARRON, George E. Rugger and Joseph E. Gulbierz, U.S. Army Natick (Mass.) Laboratories. Assigned to the Body Armor, Clothing and Equipment Development Branch, this team is credited with increasing the performance and lowering the cost of lightweight individual and aircraft protective armor, thereby providing improved capability for protecting personnel against small-arms fire. This resulted in "significant reduction in the number of personnel killed or wounded in action and a reduction in the loss of valuable equipment in Viet Nam."

IRENE K. FISCHER and Mary Slutsky, U.S. Army Map Service, Army Corps of Engineers, Washington, D.C. Working as a team, they contributed to the scientific evaluation of concerted geodetic efforts. They provided overall insight into the problem of continental geodetic measurements and pointed out factors for continued study to produce a well-suited South American Datum.

HAROLD P. HATCH, Kenneth A. Fowler and Robert H. Brockelman, Non Destructive Testing Laboratory, Springfield (Mass.) Armory. Described in the citation as "promising young scientists," this team headed by Hatch "significantly improved" the Army's technical capability in the science and application of nondestructive testing methods to process control inspection and quality assurance examination of steel and finished gun components.

The team is recognized for advancing the state-of-the-art in the employment of Lamb Waves to detect laminar defects in steel strips; also, for development and application of novel techniques and instrumentation for the rapid sonic scanning of sintered powder metal components, and for pioneering use of harmonic voltage analysis in electromagnetic examination of carburized steel for case depth determination.

HARRY KOSTIAK, Roland G. Bernier, Donald W. Mowrer and Walter S. Vikestad, Ballistics Research Laboratories, Aberdeen Proving Ground, Md. Kostiak (GS–15), Bernier (GS–14), Mowrer (GS–13) and Vikestad (GS–12) "pioneered developments in the field of vulnerability characteristics of aircraft."

The team anticipated the need for passive protection of aircraft and encouraged feasibility design development by industry of components, such as lightweight fuel cells and composite armor; also, contributed to development of lightweight protective materials which made possible the first serious consideration of protection for personnel on helicopters and the acceptance of a protective philosophy by Army aviation.

ELMER V. MERRITT, William J. Nolan and Jerry L. Reed, Army Aviation Materiel Laboratories, Fort Eustis, Va. The AVLABS commander nominated this team for "immeasurable contributions in the field of advanced lightweight armor systems for aircraft. . . . Their contributions have and will have a marked effect on Army aviation research and development. . . ."

Research for which they are credited includes achievements that "have permitted mission planners to capitalize more fully on the versatility, agility and flexibility of air mobility concepts." Due to the intensity of their effort, the gap between "exploratory development and items delivered to the combat user was closed in a matter of a few months."

JAMES J. MURRAY and Dr. Sudhir Kumar, Army Research Office-Durham (N.C.). As a GS–16 director of the ARO–D Engineering Sciences Division, Murray has worked with Dr. Kumar (GS–15), associate director, in achieving significant research results on a vacuum-air missile-boost system that would greatly economize fuel demands at lift-off. The system exploits the potential energy of atmospheric pressure to impart initial velocity to the missile when it is static.

The nomination cites them for organizing a committee on high-speed transportation; also, for consulting with Department of Commerce engineers on the pending feasibility study of a high-speed ground transportation system of novel and sophisticated design which would exploit atmospheric pressure as contemplated in the research on the missile problem.

JOHN P. ST. CLAIR, William H. Fischer, Clyde A. Clark, Robert J. Houston, Edward L. Chambers, Mylon Merriam and John C. Daly, U.S. Army Map Service. Selection of this team for an R&D Achievement Award is based on their cooperative effort in developing the Army Map Service Pictoline Process of producing maps more acceptable than the normal photomap, and with less time and effort involved than in the production of normal topographic maps.

The process was developed over a period of years and was adopted officially as a standard Army Map Service product this year. The "Picto-Map" is now reported to be in great demand by the U.S. field forces in Viet Nam.

41 Finish Initial Course In 'Scientific Management'

Forty-one military and civilian personnel of six Army Materiel Command subordinate commands recently completed the first R&D Management Orientation Course at the Army Logistics Management Center.

Another 2-week class will begin at Fort Lee, Va., June 13. Instruction is aimed at familiarizing Army R&D personnel, and those operating in support of the R&D program, with the life cycle management of research, development, testing and evaluation of Army materiel. Director of the course is Maj John E. Adams.

Dr. Seymour D. Silver, acting director of the Research Laboratories, Edgewood (Md.) Arsenal, delivered the graduation address on "The Management of Scientific Effort."

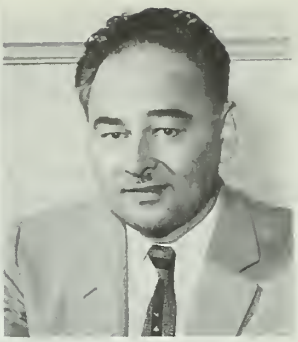
Army Research & Development Award Winners

(Additional photos on pages 35 and 36.)

EIGHT of 32 Research and Development Achievement Award winners for 1966, pictured at the left, are (1) Harold P. Hatch, (2) Kenneth A. Fowler and (3) Robert H. Brockelman, a research team from the Non Destructive Testing Laboratory, Springfield (Mass.) Armory; (4) Irene K. Fischer and (5) Mary Slutsky, woman scientists with the U.S. Army Map Service, Army Corps of Engineers, Washington, D.C.; (6) Edward R. Barron, (7) Joseph E. Gulbierz and (8) George E. Rugger, a team assigned to the Body Armor, Clothing and Equipment Development Branch, Natick (Mass.) Laboratories.

Frederick S. Wyle

George W. Bergquist



Joseph S. Hoover

Hoover, Bergquist, Wyle Take Oaths as ASD Deputies

Deputy Secretary of Defense Cyrus R. Vance administered the oath of office to Joseph S. Hoover as one of three Deputy Assistant Secretaries of Defense installed within eight days.

Mr. Hoover moved into the newly created position of Principal Deputy Assistant Secretary of Defense (Comptroller) after serving since early 1961 as Deputy Assistant Secretary of Defense (Budget). He began his Federal Service career in 1930.

George W. Bergquist was installed as Deputy Assistant Secretary (Management Systems Development) in the Office of the Assistant Secretary of Defense (Comptroller).

Frederick S. Wyle took the oath as Deputy Assistant Secretary for Policy Planning in the Office of the Assistant Secretary of Defense for International Security Affairs.

Mr. Bergquist, director, Plans and Programs Division, Bureau of Naval Weapons, since 1961 is now responsible for development and implementation of resource management systems throughout the Department of Defense and for policies and procedures in the accounting and audit fields.

Mr. Wyle assumed his new duties after serving as Special Assistant to the U.S. Defense Representative, North Atlantic and Mediterranean Areas in Paris and on the Policy Planning Council, Department of State. He is responsible for DoD long-range policy planning and politico-military matters in the international field and for coordinating these with the Department of State.

Mr. Hoover will supervise, direct and review the Defense program/budget system and act for the Assistant Secretary of Defense (Comptroller) in his absence. Promoted this year to brigadier general in the Air Force Reserve, he served until recently with the Air Force as Director of Budget and Assistant for Materiel.

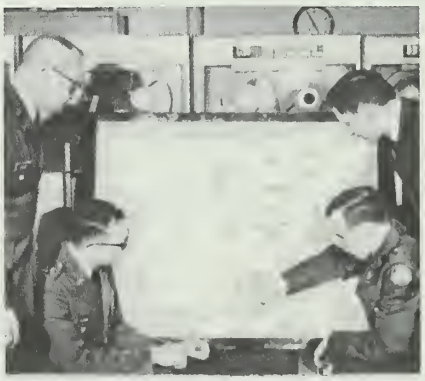
University of Utah ROTC Cadets Train With Computers

Reserve Officer Training Corps cadets at the University of Utah are being used for studies on the use of computers for small unit tactical problems in war gaming. All of the cadets are majoring in programing and computer analysis.

The feasibility studies are directed by Col Salvo Rizza, professor of military science at the university, and Peter Hein of IBM Corp.

Thus far, the tests have indicated that, although the computer cannot simulate all tactical problems or fulfill reasoning or judgment requirements, it does provide an exceptional vehicle for training future officers in causes and effects in the more finite basic logistical and tactical problems.

The ROTC program is structured around general problem-solving techniques. The computer is reported to have helped the students appreciate more fully the time-distance factors, organizational and structural concepts, effects of weapons, terrain, communications procedures, small unit mobility and firepower, supply and demand, and the interrelationships among all tactical problems.



COMPUTER STUDY group includes (l. to r.) Capt Roger B. Woods, assistant professor of military science, University of Utah; Cadet Lt John R. Ritzman, Cadet Lt Col Robert J. Williams and Peter Hein, IBM Corp.

WSMR Reorganization Creates New Quality Assurance Office

Organizational realignment at White Sands (N. Mex.) Missile Range, to be completed in July, has created a Quality Assurance Office and established three deputy positions.

WSMR Commanding Officer Col Karl F. Eklund said the changes are being made to eliminate duplication of responsibilities and efforts, to apply principles of good management in meeting increased range requirements with present resources, and "at the same time provide a more acceptable product."

A deputy for National Range Engineering will provide single management of the Range's engineering efforts. His office will standardize engineering practices, improve reliability standards and promote more effective use of range facilities.

A deputy for Army Missile Test and Evaluation will consolidate elements formerly assigned to the Army Missile Test and Evaluation Directorate and will be responsible for all Army missile tests.

A deputy for National Range Operations will run the National Missile Range. The present Computer Directorate will be renamed the Analysis and Computation Directorate and will include the present Data Analysis Directorate and Weapons Systems Simulation Branch of the Army Missile Test and Evaluation Directorate.

Fort Huachuca Sets Up Special Programs Office

Four phases of the U.S. Army's economy and improvement effort—Zero Defects, Incentive Awards, Work Simplification and Cost Reduction—have been grouped in a Special Programs Office at Fort Huachuca, Ariz.

The Department of the Army-approved program at the Electronic Proving Ground will operate on a trial basis during Fiscal Year 1967 under Guy C. Bevers, head of the year-old Zero Defects office at the EPG.

Civilian specialists in the cost-saving functions began organizing last April—with cross-training for personnel slated—to enable the actual test period to begin July 1.

Under the common office, all ideas, suggestions, error-cause identification and cost-reduction actions will be studied for possible application to any or all programs.

Bevers said that successful functioning of the combined programs in one office could mean Armywide adoption of the consolidation concept.

Main Battle Tank Management Shifts from Germany to U.S.

Management of an advanced new phase of the Main Battle Tank 1970s Program is in the process of being shifted from Germany to Warren, Mich. Completion of the move is expected in July.

Fabrication of pilot models and testing of the joint United States and Federal Republic of Germany (FRG) tank design will take place at the General Motors Technical Center near Detroit.

U.S. prototypes will be built at the Cleveland (Ohio) Army Tank-Automotive Plant, and the FRG will construct an equal number of prototypes in Germany.

U.S. personnel involved in the development in Germany will return to various locations in this country to continue their work. Approximately 250 professionals, including some of the German military and civilian personnel on the project, will be transferred.

Main Battle Tank Program managers are Maj Gen W. G. Dolvin for the U.S. and Dr. Fritz Englemann for the Federal Republic of Germany. General Dolvin, on duty at the U.S. Army Materiel Command Headquarters, Washington, D.C., also is manager of the vehicles which are, or will be, associated with the tank such as the Heavy Equipment Transporter and Tank Recovery Vehicle.

The start of the prototype production phase marks a milestone in the 2-nation tank-development program initiated under an agreement between officials of the U.S.A. and the FRG in August 1963. The agreement created an international 2-man Program Management Board (PMB) to execute a joint effort to design a single tank, producible in either country.

The PMB has met about 15 times during the 33-month-long program. It has issued numerous "decision sheets," which financially obligate both countries to continue the joint program. Currently, it is preparing plans for advance production engineering of the final model. All costs are shared on a 50-50 basis.

The PMB first retained the services of Lockheed Missile and Space Co. to run a highly sophisticated Parametric Design/Cost Effectiveness Study, and created a Joint Engineering Agency (JEA) composed of Government personnel to break out and then review design tasks, guided by input from the study.

Concurrently, each nation selected a civilian industrial firm as its Engineering Assistance Contractor. The U.S. selected the General Motors Corp. and the FRG selected the German Development Corp. Personnel from these contractors composed a Joint Design Team (JDT) to take its tasks from the JEA.

Personnel from the JEA and the JDT will be moving operations to the General Motors Technical Center in the U.S. German personnel will enter and remain in the U.S. under provisions of the Status of Forces Agreement (SOFA) that also covered the stay of U.S. personnel in Germany.

The U.S. Department of Defense reports that American and German experts have overcome almost insurmountable linguistic and technical differences in reaching agreement on "one" tank, as called for in the basic agreement, in a remarkably short time. Not only has a mutually agreeable design been established, but remaining development workloads have been defined and assigned to the nation responsible for execution.

The United States, for instance, will furnish a new high-horsepower multifueled engine, incorporate its Shillelagh missile system into a newly designed Primary Armament System, and submit a new type suspension system for final selection by the PMB.

The FRG will furnish a uniquely designed transmission capable of handling the high horsepower output promised by the American engine, continue development of a more conventional German high-horsepower engine as a backup, and submit a new type suspension system also for final selection by the PMB.

An example of the type of problem besetting those involved in the highly complex joint project was a "nut and bolt" problem. An American standard inch bolt would not fit properly in a metric-bored hole and vice versa. After much deliberation, in June of 1965 the German Ministry of Defense and the U.S. Department of Defense agreed that, although the tank would be dimensioned in both metric and inch measurements, the fastener system of the developing country would be used for each component and the ISO (International Standardization Organization) metric-thread-fastener standard would be utilized at the interface of major components.

Since the new Main Battle Tank will be expected to fight and survive on a nuclear battlefield, many details concerning the project remain classified. The U.S. Department of Defense has stated that no single task now appears to be unsolvable, and that progress of the U.S./FRG development program continues to move ahead.

With its success comes increased interest from other NATO nations. The PMB has briefed many friendly nations to date and expects the benefits of cooperative development—lower initial costs and lower ultimate logistic costs—will be shared by others beside the U.S. and Germany.

Gerwin Resigns from HDL for NASA Post

Harry L. Gerwin resigned as associate technical director at the Harry Diamond Laboratories, Washington, D.C., to report to NASA in mid-May as manager of Project ATS–4 at the Goddard Space Flight Center, Greenbelt, Md.

Gerwin is directing the NASA project to develop and demonstrate precise spacecraft stabilization and control techniques in connection with the erection of large spacecraft antenna.

He received his BS degree in mechanical engineering at the Missouri School of Mines and Metallurgy in 1938. From 1941 to 1945, he served as a Naval officer, then served until 1952 on the civilian staff of the Naval Research Laboratory (NRL).

After joining the National Bureau of Standards (NBS), he stayed with the portion of the NBS staff transferred to the Ordnance Corps to provide the nucleus of the new research group when the Diamond Ordnance Fuze Laboratory (DOFL) was activated in 1953.

With consolidation of the seven Technical Services of the Army in 1962, DOFL was renamed the Harry Diamond Laboratories and became an installation under the Army Materiel Command.

Gerwin has published over a dozen professional papers and has been granted four patents. He received a Citation of Outstanding Performance from the Navy while serving at NRL and a Certificate of Achievement from DOFL for outstanding contributions to technical design and administration of a guided missile program.

Harry L. Gerwin

Top Army Officials Hear First RAC Progress Report

Assistant Secretary of the Army (R&D) Willis M. Hawkins and Chief of Research and Development Lt Gen Austin W. Betts headed 22 Army dignitaries who heard the first semi-annual progress report of the Research Analysis Corp. at McLean, Va.

RAC is a non-profit research organization formed in 1961 as the main operations research contract gency for Department of the Army.

Dr. Philip H. Lowry, head of RAC's Combat Analysis Department, and Lawrence J. Dondero, head of the RAC Military Gaming Department, gave the briefing. Twelve of 55 major projects in the RAC work program for Army research were discussed.

Attending the briefing were Lt Gen Charles H. Bonesteel, III, Director of Special Studies, Office of the Chief of Staff (OCS); Lt Gen Lawrence J. Lincoln, Deputy Chief of Staff (DCS) for Logistics; Maj Gen William C. Gribble, Jr., Deputy Chief of Research and Development; Maj Gen Charles Billingslea, Deputy CG, Combat Developments Command; Maj Gen James E. Landrum, Special Assistant for Army Information and Data Systems, OCS;

Also, Brig Gen Paul D. Phillips, Co-Director, Force Planning and Analysis Office, OCS; Dr. Jay Tol Thomas, Director of Research and Laboratories, Army Materiel Command; Dr. Wilbur B. Payne, Chief, Office of Operations Research, Office of the Under Secretary of the Army; Col K. C. Emerson, Assistant for Research, OASA (R&D); Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research, Army Research Office (ARO);

Also, Col Wallace L. Clement, Director of Personnel Studies and Research, Office of the DCS for Personnel; Col Thomas N. Chavis, Assistant Director of Army Research and CO of ARO; Col Kenneth M. Jones, Office of the DCS, Logistics; Col John H. Swenson, Office of the Assistant Chief of Staff, Intelligence;

Also, Col Raymond H. Hitchcock, Office of the Assistant Chief of Staff for Force Development; Col Stephen A. Day, Office of the DCS, Operations; Col D. P. McAuliffe, OCS; Col Herald B. Gallinger, ARO; R. J. Trainor, Office of the Comptroller, and William K. Brehm, OCS.

DASA Joins Canada, Britain In New Balloon Blast Tests

Operation Distant Plain, a series of blast and shock experiments, will be conducted in Western Canada this summer and next winter with the Defense Atomic Support Agency (DASA) cooperating with Canadian and British scientists.

This is a continuing program involving the explosion of nonnuclear chemical charges up to 500 tons. Two of the six summer tests will use detonable gases in large balloons, a new technique excepted to yield data comparable to that previously obtained from solid TNT charges.

DASA is particularly interested in this technique as a phase in Project SLEDGE (Simulating Large Explosive Detonable Gas Experiment).

STRATCOM Activates New Signal Brigade in S.E. Asia

The U.S. Army Strategic Communications Command 1st Signal Brigade was activated recently in Viet Nam as one of STRATCOM's five commands.

Nominated for brigadier general rank, Col Robert D. Terry has been named commander of the Brigade and will serve concurrently as signal staff officer to General William C. Westmoreland, CG of the U.S. Army, Viet Nam. Col Terry served in the Army Research Division, preceding establishment of the Army Research Office, Office of the Chief of R&D.

Under command of Maj Gen Richard J. Meyer, CG of STRATCOM, the other four headquarters are located near Heidelberg (STRATCOM-Europe); at Suitland, Md., (STRATCOM-CONUS); in Panama (STRATCOM-South); and at Schofield Barracks, Hawaii (STRATCOM-Pacific).

Col R. D. Terry

The Brigade will be responsible for all communications requirements of the commanding officers of U.S. Military Assistance Commands in Viet Nam and Thailand.

Until assigned to Viet Nam, Col Terry was chief of staff, U.S. Army Electronics Command, Fort Monmouth, N.J. He is a 1942 graduate of West Point, earned the Rhineland and Central Germany Campaign Stars during World War II, holds a master's degree in electrical engineering from the University of Illinois, and has served as a professor of electricity at the U.S. Military Academy at West Point, N.Y.

Following service at Manila and with the Alaska Communications System, he was stationed in Paris with the Defense Department's Mutual Weapons Development Team.

Elder Reports to OCRD; Blewett Moves Up to JCS

Lt Col James M. Elder reported recently to the Office of the Chief of Research and Development as staff officer, Review and Analysis Division of the Plans and Programs Directorate.

Lt Col J. M. Elder

Until recently he was commander of the 1st Missile Battalion, 43rd Artillery (Nike Hercules) at Fairchild Air Force Base, Spokane, Wash. From 1964–65, he was with the Military Advisory Assistance Group IV Viet Namese Corps.

Col Elder is a 1946 graduate of the U.S. Military Academy, attended the U.S. Army Command and General Staff College in 1961, and completed the Artillery Advanced Course in 1956. He holds the Bronze Star, Air Medal and Army Commendation Medal with two OLC.

LT COL REX R. BLEWETT, selected for promotion to colonel, has been assigned to the Office of the Joint Chiefs of Staff as assistant secretary.

Since June 1965, he had served as assistant executive officer in the OCRD Administrative Office. Lt Col Walter E. Coleman of the OCRD Review and Analysis Division has been assigned to succeed Col Blewett.

DONN R. GRANDPRE, with the International Office of OCRD since July 1958, has departed for a position in the Office of the Assistant Secretary of Defense (International Security Affairs) John T. McNaughton.

LT COL WILLIAM B. LEDBETTER, with the Life Sciences Division of the Army Research Office, Arlington, Va., since January 1963, has been assigned to the 3700 Headquarters Medical Division, U.S. Army Europe.

Col Kellogg Assumes CRREL CO Duties

Col Dimitri A. Kellogg assumed duties June 1 as acting commanding officer of the U.S, Army Cold Regions Research and Engineering Laboratory (USA CRREL), Hanover, N.H.

The temporary assignment followed retirement of Col Philip G. Krueger, who had served as CO at USA CRREL since July 1964.

Following an assignment as a staff officer with the Physical Sciences Division, U.S. Army Research Office (1959–60), Col Kellogg served as Assistant Army Attache at Bonn, Germany (1961–64).

Major assignments include Army Materiel Command Research Division since 1965; Headquarters, Allied Forces Southern Europe, Naples, Italy (1955–59); U.S. Navy Radiological Defense Lab (1952–55).

During World War II he served with several aviation engineer battalions in the Far East. He was assigned with the Armed Forces Special Weapons Project at Los Alamos and Sandia Base, N. Mex. (1946–49).

He received a BS degree in chemistry (1939) from the University of California, where he was elected to Phi Beta Kappa. Graduated from the U.S. Military Academy in 1943, he studied at the University of New Mexico and the University of California, receiving his doctoral degree in nuclear physics from the latter university in 1952.

Col Kellogg has attended the U.S. Army Command and General Staff College, the Strategic Intelligence School, and the Industrial College of the Armed Forces.

Col Dimitri A. Kellogg

Army Adds $1.5 Million To Shillelagh Production

Selection of a second production source for Shillelagh antitank guided missiles was announced by the Army with a $1,525,506 contract.

Martin Marietta Corp. will establish facilities and produce a number of missiles to qualify for large-scale production under terms of the contract. Five contractors from among 37 industrial firms to which the Army sent requests for quotations entered the competition.

Used for frontline attack and infantry support, Shillelagh will give soldiers increased firepower against armor, troops and field fortifications. Guided by a command system mounted on the launching vehicle, it is capable of maneuvering in flight to attack a moving target.

Shillelagh's 152mm gun-launcher can fire either a missile or a conventional round of ammunition. The system is the main armament for the General Sheridan Armored Reconnaissance Airborne Assault Vehicle, and is planned for use on a conversion of the M60 current main battle tanks, as well as on the United States/Federal Republic of Germany Main Battle Tank for the 1970s.

Aeronutronic Division of Philco Corp. is the present contractor for Shillelagh. The shillelagh program is managed by the U.S. Army Missile Command at Redstone Arsenal, Ala., under Lt Col Spencer R. Baen.

Introduction of the Shillelagh weapon system into the Army will provide a significantly improved antitank capability for armor units.

DoD Offering Commissions for Osteopaths

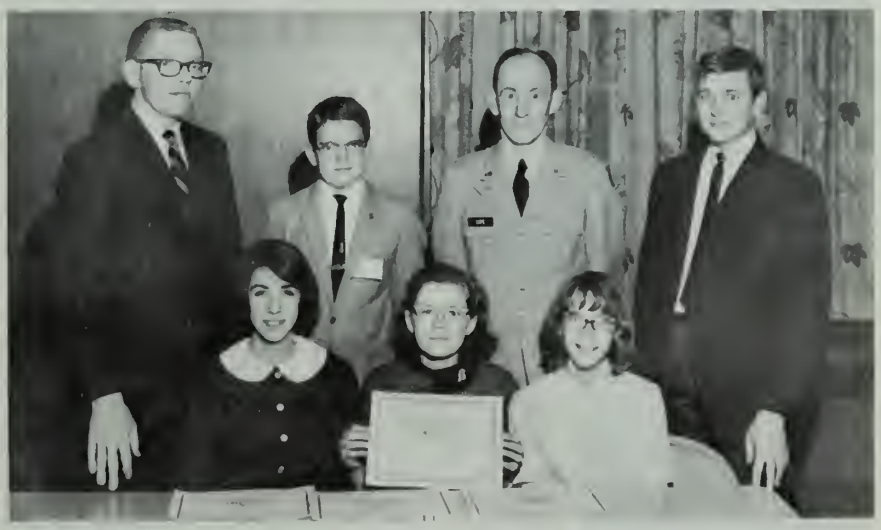
Qualified doctors of osteopathy who volunteer may be accepted for commissioned rank in the medical corps of the Armed Forces under new instructions from Secretary of Defense Robert S. McNamara to the Secretaries of the Army, Navy and Air Force.

A 1956 law allowed the military services to commission osteopaths but did not make commissioning a requirement as it did for doctors of medicine. Commissions in the equivalent grade of Army captain will be offered under new regulations drawn by the Services.

The basis requirement for appointment is graduation from a college of osteopathy whose graduates are eligible for licenses to practice medicine or surgery in a majority of the states. Graduates must be licensed to practice medicine, surgery or osteopathy in one of the states or territories of the U.S. or in the District of Columbia.

Doctors of osteopathy interested in active commissioned military service may obtain details from the Surgeon General of the Armed Service preferred, Washington, D.C.

3252d USAR R&D Unit Aids Science Fair Exhibit



3252d USAR R&D UNIT Commanding Officer Col David F. Cope poses with Southern Appalachian Science Fair winners at Knoxville, Tenn. The Oak Ridge, Tenn., Unit also participated in recent science fairs at Williamsburg, Ky., and Cookeville, Tenn. Nineteen Department of the Army Certificates were awarded in cooperation with Science Service, the nonprofit organization that sponsors the International Science Fair. The 3252d USAR R&D Unit has participated in Science Fair activities for the past three years. Southern Appalachian winners above are (l. to r., seated) Margaret M. Slater, Sherry Ellen Berry, Linda Patrice Goff; Bill Amos, Robert L. Cook, John Nittooker, Jr.

NATO Plans Aurora, Airglow Meeting

Scientists from NATO countries will consider the phenomena of aurora and airglow—manifestations associated with atmospheric electrically charged particles—at an Advanced Study Institute, Aug. 14–26, at the University of Keele (Staffordshire), England.

Financial support is being provided by NATO, U.S. Department of Defense agencies, including the Army Research Office, the U.S. National Science Foundation and U.S. industrial research organizations.

The Ballistic Research Laboratories, Aberdeen (Md.) Proving Ground, and the Institute of Exploratory Research, Army Electronics Command, Fort Monmouth, N.J., each will select a scientist to represent Army research and development.

Dr. Billy M. McCormac, director of the Geophysics Division of the Illinois Institute of Technology Research Institute (IITRI), Chicago, Ill., has accepted a NATO invitation to serve as chairman of the sessions, at which about 40 technical papers, each 50 minutes long, will be presented. The former U.S. Army and Defense Atomic Support Agency scientist conducted a similar conference in August 1965 at Bergen, Norway, on "Radiation Trapped in the Earth's Magnetic Field."

Aurora and airglow basically are visible manifestations of ionized areas of the atmosphere and are related to solar phenomena, the earth's magnetic field, and trapped radiation. Dr. McCormac said that results of the August study, which will be available to all participants, "will serve to update information affecting communications, reentry, and phenomena associated with nuclear detonations."

More than 100 graduate science students will be sent to the Advanced Study Institute by NATO nations. The National Science Foundation is sponsoring three students and research contractors of the Department of Defense will finance the attendance of others, Dr. McCormac said.

Session chairmen of the Institute include Lt Col Jack Brown of the Defense Atomic Support Agency (DASA) on "Artificial Aurora and Airglow" and the emminent physicist, Dr. Sidney Chapman of the University of Alaska, who will present an historical introduction to aurora and airglow.

Dr. McCormac is a graduate of Ohio State University (BS degree in 1943) and received an MS in physics (1956) and a PhD in nuclear physics (1957) from the University of Virginia.

He was an Artillery officer in the Army (1944–54) and after graduate work joined the U.S. Army Continental Army Command as a physicist from 1957–60. After serving as a scientist in the Office of the Army Chief of Staff (1960–61), he became a physicist with DASA, directing research in the effects of high-altitude nuclear detonations on electromagnetic waves.

In 1963, he became science adviser for IITRI, then was associate director of geophysics, and was promoted to director in 1964.

Dr. McCormac is the author or coauthor of numerous technical papers and is an editorial board member of *Space Sciences Review* and the Astrophysics and Space Science Library, Chicago.

Dr. Billy M. McCormac

Industry, Government Briefed At Communications—ADP Meet

THREE MAJOR PARTICIPANTS in an advanced briefing held recently for industry at Fort Monmouth, N.J., get together for an informal chat. From the left are Brig Gen William B. Latta, CG, U.S. Army Electronics Command (ECOM); Howard P. Gates, Office of the Assistant Secretary of the Army for R&D; Dr. Jerome B. Wiesner, dean of the School of Science, Massachusetts Institute of Technology. Sponsored by ECOM and the Fort Monmouth Chapter of the Armed Forces Communications and Electronics Association, the briefing dealt with military communications and electronic computer systems for automatic data processing. About 500 industry and Government officials participated.

New York Academy of Sciences Elects ECOM Senior Scientist

Dr. Donald M. Swingle, scientific adviser at the U.S. Army Electronics Command, Fort Monmouth, N.J., recently was elected a member of the New York Academy of Sciences.

During 1964–65, he served as a member of The Army Research Council, established to advise the Assistant Secretary of the Army for Research and Development and the Army Chief of R&D on research plans, policies and programs.

As an Army employee, his work has encompased small-scale meteorology, weather radar, acoustic and electromagnetic (radio) wave propagation, atomic fallout prediction and electronic systems.

General Goodpaster Assigned As Joint Staff Director, JCS

LT GEN ANDREW J. GOODPASTER has succeeded Lt Gen David A. Burchinal, U.S. Air Force, as Director of the Joint Staff, Joint Chiefs of Staff. President Johnson has nominated General Burchinal for 4-star rank, subject to U.S. Senate confirmation, and he has been assigned as Deputy Commander-in-Chief, U.S. European Command. General Goodpaster has been serving as assistant to the Chairman of the Joint Chiefs of Staff.

Dr. MacArthur Gets New Deputy DDRE (C&M) Post

Transfer of the Office of Director of Defense Technical Information from the Deputy Director of Defense Research and Engineering (Administration and Management) to the Deputy Director (Chemistry and Materials) is part of a recent DDR&E realignment.

Appointment of Dr. Donald M. MacArthur as Deputy Director (Chemistry and Materials), a recently created position, makes him one of the youngest scientific managers in the Department of Defense. Until installed in his new office, he had served since 1958 as a senior chemist with Melpar, Inc.

In addition to his responsibility for the Office of Director of Defense Technical Information, formerly under the Deputy Director (Administration and Management), Dr. MacArthur is charged with technical review and evaluation of all Defense research and development in the fields of chemistry and materials.

Responsibility for chemistry and materials formerly was assigned to the Deputy Director (Research and Technology), Dr. Chalmers W. Sherwin, who is now charged with management of in-house laboratories and the research program of the Deputy Director of Defense Research and Engineering.

Dr. MacArthur was manager of the Melpar, Inc. Chemistry and Life Sciences Center before the DDDR&E appointment. Educated in Scotland, he received a BS degree in 1950 from St. Andrews University and a PhD degree in physical chemistry from Edinburgh University in 1957.

Dr. Donald M. MacArthur

GIMRADA Investigates New Survey Instrument

An all-weather angle-measuring instrument for surveying in poor visibility is under study by the U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA), Fort Belvoir, Va.

The instrument is designed to complement other all-weather surveyor's tools such as microwave distance-measuring equipment and gyroscopic northseeking devices developed by the Army Engineers to establish and extend survey control for artillery and combat mapping operations in mobile warfare.

Currently, experimental models of two versions are undergoing preliminary tests. An optical system for limited inclement weather operations and a microwave system for practically all weather operations will be tested to determine the instrumentation precision and to measure the effects of atmospheric conditions on the precision.

Employing an electronic sensing unit and a high intensity light source, the 50-pound optical instrument was built by Automation Laboratories, Inc., Mineola, L.I. The microwave system built by Cubic Corp., San Diego, Calif., incorporates an electronic assembly consisting of two antennas with associated electronics for phase comparison of the 35 gigacycle signal received by each.

Scientists Convene to Fathom 'Ice Islands'

Arctic research conducted from floating "ice island" stations was discussed by about 100 scientists and engineers at a recent 3-day symposium sponsored by the Office of Naval Research and the Arctic Institute of North America, the ONR contract agency.

Participants were representative of the U.S. Armed Forces, other Federal agencies, private industry and academic research organizations in the United States, Canada and Japan. The symposium was held at Airlie House, Warrenton, Va., and was highlighted by some 30 technical presentations.

Although not actively involved in drift station research, the Army maintains cognizance in this area of environmental study. Army participants in the symposium included Dr. W. F. Weeks, chief, Ice and Snow Group, Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, N.H., and Donald C. Hilton, Office of the Chief of Research and Development.

The Air Force began the first ice island research for the United States in 1952 and the Soviet Union is also active in this field. The program gained momentum during the International Geophysical Year (IGY) in 1957–1958.

ECOM Selects Mindell as Program Comptroller

The new comptroller and director of programs at the U.S. Army Electronics Command at Fort Monmouth, N.J., Joseph Mindell, was appointed after completion of an assignment in France with the U.S. Army Communications Zone, Europe.

The 2-time winner of the Army Meritorious Civilian Service Award (MCSA) succeeds Lt Col Francisco Mejia-Flores, reassigned as ECOM assistant chief of staff for Operations Readiness (SEA).

Since beginning his Civil Service career in 1937 with the Department of Agriculture, Mindell has compiled more than 25 years experience in Government accounting, budgeting and comptroller work.

For six years following World War II, he was employed in the office of the Chief of Army Transportation in Washington, D.C., and later became deputy comptroller. In 1954 he transferred to headquarters, Fourth U.S. Army, Fort Sam Houston, Tex., as deputy comptroller.

He received the Army MCS Awards, the second highest bestowed for civilian service, in recognition of services with the Chief of Transportation and for his work with the Fourth U.S. Army.

Mindell attended Central Missouri (Warrensburg) State College and George Washington College, majoring in business administration. He graduated from the Industrial College of the Armed Forces, Fort McNair, Washington, D.C.; Comptroller Staff Officer course, Maxwell Air Force Base, Ala.; Command Management School, Fort Belvoir, Va.; and the Personnel Management course, at Fort Sam Houston.

He left for France in 1961 to become executive assistant to the chief of the Supply and Maintenance Agency in Orleans, France, under command of Brig Gen Charles C. Chase.

Joseph Mindell

Power Sources Meeting Learns of First Air-Breathing Fuel Cell

Successful development of the first air-breathing fuel cell for ground use was announced at the 20th Annual Power Sources Conference May 24–26 in Atlantic City, N.J.

Sponsored by the U.S. Army Electronics Command in cooperation with the Interagency Advanced Power Group, the meeting was attended by over 1,200 representatives from industry, Federal Government agencies, R&D organizations, universities and foreign countries.

The new portable fuel cell, employing liquid hydrazine as the fuel, was developed by the U.S. Army Electronics Command and Monsanto Corp. This electrochemical silent-power source weighs less than 12 pounds, has an output of 60 watts and can operate for 12 hours on one pound or one pint of fuel.

Other types of terrestrial fuel cells systems also were discussed. Army personnel reported that fabrication and testing of the first development models of the indirect hydrocarbon/air fuel cell, using a hydrocarbon reformer to produce hydrogen, is nearing completion. This system offers a means of using conventional fuels, eliminating the need for supplying special fuels required in other systems.

Another area featured at the fuel cell session was the direct electrochemical oxidation of hydrocarbon. It was pointed out that the electrocatalyst problem is the most important one that remains to be solved, as the platinum cost of present-day electrodes for hydrocarbon fuel cells is prohibitively high.

Considerable attention is being given to the mechanism of electrocatalytic reactions. These reactions, though analogous to that in gasphase catalytic reactions, present distinct problems because they are influenced by the electrical field.

The use of inexpensive carriers for noble-metal catalysts was reported as an effective approach towards reducing catalyst cost for direct anodic oxidation of hydrocarbon fuels.

The new metal-air batteries were featured in the session on High Energy Density Battery Systems. These batteries, employing zinc or magnesium anodes and fuel cell-type air cathodes were reported to deliver up to 100 watt-hours per pound at relatively high current drains. In most of these batteries, discharged anodes are removed and replaced with fresh anode charges, although complete throw-away battery designs are being investigated.

A zinc-air secondary battery system designed for vehicular propulsion was also described. In this design, the alkali electrolyte is circulated through the cells during both charge and discharge. Several potential motive-power applications for such battery systems were reviewed, including material handling vehicles, delivery vans and buses, and some types of private automobiles.

A special session was devoted to a thorough discussion and analysis of high-energy-density nonaqueous batteries. These nonaqueous systems permit the use of highly active anode and cathode materials, such as lithium and metal halides, with theoretical energy densities of over 500 watt-hours per pound.

The most serious problems rest with high resistance of the electrolyte, which limits the high discharge-rate performance of the cell system. Experimental batteries giving up to 150 watt-hours per pound, though at moderate and low discharge rates, were discussed.

An all-day session was held on secondary batteries, covering a detailed examination of charge control devices, improved silver batteries, sealed nickel-cadmium cells, and thin-plate lead calcium batteries. A number of devices for charge control were discussed, including auxiliary (third) electrodes, stabistors (Amp-Gate Diode), coulometers and current sensing.

It was reported that in those batteries where each cell contains an auxiliary electrode, the electrode which first reaches the threshold level during early cycling continues to be the controlling electrode throughout the life of the battery. If this situation is found to be true under all conditions that a battery may encounter, it may not be necessary to have a sensing element on every cell.

Recent work on the design of sealed silver-zinc cells through the use of improved negatives and special separator materials has resulted in a significant improvement in the cycle life of this battery. Over 300 cycles were obtained on a charge-discharge cycle with the batteries being discharged to a 62½ percent depth.

Sealed nickel-cadmium cells cycled at 150° F. showed permanent changes in their electrode potential-time curves on charge when the temperature was reduced to 77° F. Cells were also more susceptible to hydrogen generation on charge after the temperature was lowered from 150° F. to 77° F.

Nonrotating thermal energy conversion devices employing the thermoelectric, thermionic and thermophotovoltaic were discussed at the session on Thermal and Solar Energy Conversion. Innovations in the thermal conversion field are an ultrasonic-atomizing burner (which burns hydrocarbon fuels ranging from gasoline to No. 2 burner fuel) and the heat pipe.

The heat pipe is a means of conducting heat to a device, such as a thermionic emitter, and at the same time protecting it from the combustion products of the flame.

Laboratory tests of a 100-watt thermoelectric generator employing silicon-germanium thermocouples and the multiliquid fuel burner showed the advisability of proceeding with this development towards an experimental model.

The details of a design of a 3-kilowatt flame-heated thermionic generator, using three one-kilowatt modules of cylindrical thermionic converters, a heat pipe, and a solid-state power conditioner were presented.

A paper describing the progress in thermophotovoltaic energy conversion over the past three years was featured at this session. The development status of germanium cells was described and compared with preliminary data obtained with high-flux silicon cells.

Particular emphasis was placed on the means of generating or converting the most effective spectral characteristics from a radiative heat source that a photovoltaic cell can convert into electrical power with the highest efficiency.

The final session dealt with power conditioning, or the conversion of the low-voltage d.c. output of the new power system to more useful forms of electrical energy. Design considerations pertinent to a 2-state modulation system were discussed.

The system consists of a simple closed loop with a hysteretic power-switching circuit in the forward path and a linear passive feedback path. The d.c. output voltage is recovered through a low-pass outward filter.

Transistorized equipment installed in military tracked vehicles was reported to be highly susceptible to damage from transient voltage surges occurring in vehicular electrical systems. Army engineers showed techniques being considered for equipment protection, including a cutoff type transient voltage suppressor for vehicular radio sets.

"Proceedings" of the conference are published and distributed by the PSC Publications Committee, P.O. Box 891, Red Bank, N.J. 07701.

Army 'Flattop' Operating As Aircraft Repair Facility In Cam Ranh Bay Vicinity

U.S. Army aircraft operating in South Viet Nam now have their own repair ship strategically anchored in Cam Ranh Bay, the first vessel to operate under the Army Materiel Command's Project Flattop.

U.S. Naval Ship Corpus Christi Bay, formerly the *USS Albemarle* (*AV*–5), of the Navy's World War II seaplane-tender fleet, arrived on station Apr. 2. The Military Sea Transportation Service (MSTS), Washington, D.C., said she sailed from her home port, Corpus Christi, Tex., following conversion at the Charleston (S.C.) Naval Shipyard, U.S. Naval Base.

Corpus Christi Bay, a 538-foot vessel manned by an MSTS crew of 130 civilians, is the Army's only floating aircraft maintenance facility (FAMF–1). The ship is designed to support helicopter soldiers operating in areas where repair facilities are inadequate. More than 300 men of the Army's First Transportation Corps Battalion (AMD) (SBN) man the shops and other Army equipment on board.

In addition to helicopter landing platforms fore and aft, and 32 repair and machine shops throughout its five decks, the ship has a seagoing Technical Data Library (TDL) to speed repair information to technicians.

Containing more than 1,250,000 microfilmed documents, the TDL was installed under the direction of the Army Missile Command (MICOM), Redstone Arsenal, Ala.

The Department of Defense and International Standardization Office, Engineering Documentation Division, Procurement and Production Directorate at MICOM has overall responsibility for the TDL information storage and retrieval mission.

Information from the library is relayed to the repair shops in the ship by closed-circuit television, facsimile transmitters and receivers, and an intercom system.

An engineering drawing or details of a helicopter assembly can be retrieved automatically from the microfilm library, televised and viewed simultaneously in a repair shop. If the technician needs a copy, the library clerk operates a scanner which transmits in a few minutes hard copy of any document to a facsimile recorder in the shop area.

Project Flattop was started in 1962 by AMC as a logistic backup concept for the soldier in the field. The *Albemarle*, in mothballs with the New York Group of the Atlantic Reserve Fleet since 1950—after nearly 10 years of service—underwent about 17 months of modification at the Charleston shipyard before she was accepted by the Department of the Army.

***USNS Corpus Christi Bay*, 14,845-ton Aircraft Maintenance Facility**

'Do It Yourself' Computer Speeds R&D at WSMR

Do-it-yourself statistical and numerical analysis of tests conducted by scientists and engineers at White Sands (N. Mex.) Missile Range is possible with a new OMNITAB computer program.

Even those scarcely familiar with punch cards can make their own computations with the new system, WSMR reports. It provides nonprogramers with direct access to a large digital computer on a day-to-day basis.

Techniques and operations involved in the program, developed by the U.S. National Bureau of Standards, are no more complicated than those required for operation of a desk calculator. Operation costs are reduced by elimination of the "middleman," the programer; economies in time also are possible.

OMNI stands for "one in a series of omnibus programs"; TAB denotes capability to handle a wide range of tabular numerical operations. Its worksheet type format consists of 46 columns and 101 rows that are formated automatically, and it responds to simple English instructions.

Systems Analyst H. B. Wetzel, WSMR Calibration Division, explained that the program was not applicable to older computers but is usable with the recently acquired DCS 7044 and 7090, which are hooked together in a system where one reads tape and the other (the slave) performs computations.

The program gives the user maximum flexibility, generality and sophistication, yet keeps to a minimum the requirements for prior knowledge of computer hardware. Users soon learn the value of punching their own cards.

Flow charts, which are essential with most programs, are unnecessary with OMNITAB. All that is required of the user is to keep track of what column on the worksheet tells what.

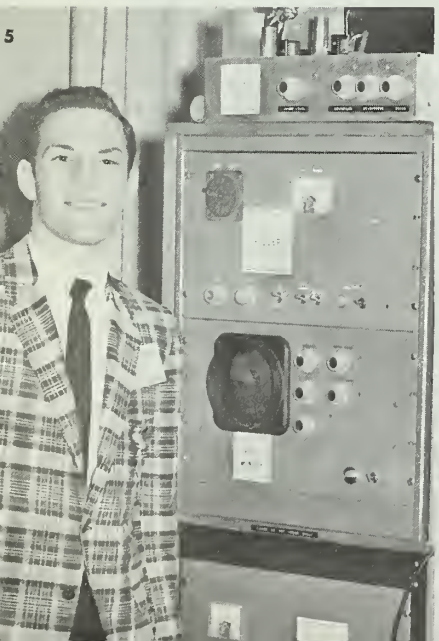
Gordon B. Anderson, chief of the WSMR Physical Measurements Section, Calibration Division, was instrumental in obtaining the program. To prepare individuals for use of the system, P. J. Walsh, a representative of the Bureau of Standards, conducted a recent 5-hour training course at WSMR.

DIAC Holds 13th Meeting Since Founding in 1962

Top management of U.S. industry met with Department of Defense leaders June 10–11 in the first session of the Defense Industry Advisory Council (DIAC) following its fourth anniversary May 23.

This was the thirteenth meeting of DIAC which was established in 1962 to provide a forum at which Department of Defense logistics, policies and practices "can be discussed at top management levels." Chairman of DIAC is Cyrus R. Vance, Deputy Secretary of Defense.

Twenty-two "captains of industry," headed by DIAC Industry Vice Chairman Ruben Mettler, president of the TRW Assistance Group, Redondo Beach, Calif., meet periodically to assist Secretary of Defense Robert S. McNamara in Government-industry logistics planning, and procedures.



Army Selects ISF Lea

From 419 talented high school students competing in the 17th annual International Science Fair at Dallas, Tex., May 11–14, U.S. Army judges selected 10 for superior awards and week-long all-expense-paid visits to Army in-house laboratories. Eighteen were given meritorious recognition and will be alternates for visits to the laboratories.

For the first time, two of the winners will have an opportunity to participate with some 500 ranking scientists in the 1966 Army Science Conference at the U.S. Military Academy, West Point, N.Y., June 14–17. Kenneth L. Hurst, 16, Ephrata (Pa.) High School, and Steven P. Lund, 16, Bismark (N.D.) H.S., won that honor.

After letting the Army grab off most of the publicity plums by showing off the pulchritude and charm of a "beauty with brains" for three consecutive years in the Japan Student Science Awards, the Air Force and the Navy each decided on a comely young lady for this year's competition in November in Tokyo.

The Army completed the "switch in scientific strategy" by turning to a gifted young man, Kenneth L. Hurst, with Steven P. Lund as alternate.

Air Force selectee is Letantia B. Jankowski, 18, Immaculate Conception H.S., Lodi, N.J., and the Navy choice is Felice R. Tillman, 18, Metairie (Pa.) Park Country Day School. Alternates are Larry G. Ferren, 17, Emporia (Kans.) H.S., Navy, and Curtis Bryant, 16, Le Mars (Iowa) Community H.S., Air Force.

On behalf of Secretary of the Army Stanley R. Resor and Army Chief of Staff General Harold K. Johnson, Deputy Chief of Research and Development Maj Gen William C. Gribble, Jr., presented the Army Awards. He also extended the invitation to attend the Army Science

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Army Superior Award Winners: **Fig. (1) Kenneth L. Hurst, (2) Steven P. Lund, (3) Robert M. Swift, (4) Robert L. Jeffcoat, (5) Howard S. Weiss, (6) Dennis A. Hejhal, (7) Eddie G. Napps, (8) Beth A. Romanowich, (9) Lee A. Weisbecker. A photo of Alice E. Mitchell, the tenth superior award winner, was not available at the time this publication went to press.**

Army Meritorious Award Winners, **representative of foreign countries: (10) Yoshito Suzuki—Japan (11) Gunnar Selstam—Sweden (12) Theodor Hildebrand—Germany.**

s for Special Awards

Conference on behalf of Chief of R&D Lt Gen Austin W. Betts, sponsor.

"Artificial Photo-Reduction" is the title of the paper and exhibit that won top honors for Kenneth Hurst. Through the use of manometers, he proved that oxygen evolved by plants comes from chloroplasts, and that light rays effect the rate of photosynthesis.

A first-time entry in the ISF, Kenneth is the son of Mr. and Mrs. Lester M. Hurst. His father is an insurance and real estate salesman and his mother is a homemaker.

"Fort Union Group," the exhibit that brought Steven Lund to the attention of Army judges, represents an ambitious study of the ecology and geography of a small inland sea 60 million years ago.

In addition to the Army award, Steven's display also won a first place award of a $100 U.S. Savings Bond from the American Institute of Mining, Metallurgical and Petroleum Engineers. Steven's father is a jeweler and his mother is a homemaker.

Three of the Army Meritorious Award Winners are representatives of foreign countries—Yoshito Suzuki (17) of Shizuoka-Ken, Japan, for an exhibit titled "Environmental Factors Inducing Seasonal Forms of Butterflies"; Gunnar Selstam (20) of Goteburg, Sweden, for "Analysis of Sternum as a Method to Determine Species of Birds"; and Theodor Hildebrand (19) of Berlin, Germany, for "Electronic Computer with Semiconductor Elements."

Army Superior Award Winners and the titles of their exhibits are: Dennis A. Hejhal, 17, Lane Technical H.S., Chicago, Ill., "Selected Topics in Complex Analysis"; Robert L. Jeffcoat, 18, Spartanburg (S.C.) H.S., "Spectral Changes in Chlorophyll Following Flash Illumination"; Alice E. Mitchell, 18, William Byrd H.S., Vinton, Va., "Discovery of the Genotype of Phasinus Colchicus";

Also, Eddie G. Napps, 18, Longview (Tex.) H.S., "Van de Graaff Particle Accelerator"; Beth A. Romanowich, 17, Point Loma H.S., San Diego, Calif., "Establishing a Blood Group System in the Laboratory Rat"; Robert M. Swift, 15, Mather H.S., Chicago, Ill., "Biochemical Study of Crown Gall Bacteria"; Lee A. Weisbecker, 16, High Point (N.C.) Central H.S., "Perfusion of VX2 Carcinoma with Alkylating Agents *in vitro*"; Howard S. Weiss, 17, Conrad H.S.,

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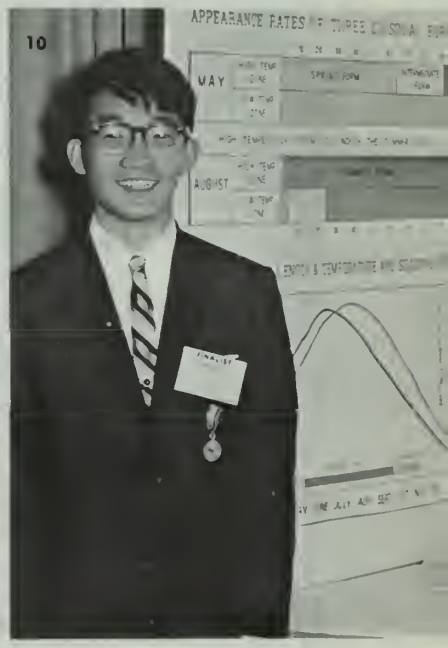


Army Lets 170 RDTE, Procurement Contracts for $682,682,261

A total of 170 contracts awarded by the U.S. Army for research, development, test, evaluation and procurement of materiel aggregated $682,682,261 since the previous edition of this publication.

Largest amount awarded to a single firm was $96,593,797 to the Kaiser Jeep Corp. in two contracts, one for $90,919,412 for 1¼-ton trucks of various body types over a 2-year period, and $5,674,385 for 5-ton trucks.

U.S. Time Corp. received two contracts totaling $25,074,461 for artillery shell fuze production, $21.5 million of which is being subcontracted to smaller manufacturers.

Caterpillar Tractor Co. was awarded $22,187,500 for tractors. Thiokol Chemical Corp. received a $19,093,947 modification to an existing contract for various quantities and types of illuminating cartridges and signals.

National Presto Industries, Inc., received an $18.8 million increment to a $32.6 million fixed-price contract for high-explosive artillery shells, and $7,602,176 for 8-inch projectile parts.

AVCO Corp. won six awards totaling $17,489,961 for repair parts for helicopter gas-turbine engines and engine modifications, fixed-base antennas (AS–1729/VRC), helicopter rotor blades, parts for 40mm projectiles, and 2.75 rocket fuzes.

Clark Equipment Co. received a $17 million order for industrial wheeled tractors and a $15 million order for vehicles of the M113 family and related kits went to FMC Corp.

Philco Corp. was awarded contracts totaling $13,928,353 for automatic digital message-switching centers, Chaparral missile system engineering services, Shillelagh missile spare parts, and engineering services and inspection equipment.

Ford Motor Co. will provide ¼-ton trucks for $13,491,648 and Sperry Rand Corp. was awarded $12,843,131 for ammunition components and gyromagnetic compass sets. Chamberlain Corp., Waterloo, Iowa, won $12,296,244 for artillery ammunition and warhead parts in four contracts.

Olin Mathieson Chemical Corp. was awarded five contracts totaling $11,801,296 for 20mm cartridge propellant, 81mm mortar illuminating shells and fuzes, 7.62 ammunition, various propellant charges and ammunition items. Raytheon Co. is getting $11,449,828 for 750-pound bombs, Hawk missile special tooling and test equipment, and radio communications equipment.

Awards totaling $11,302,201 went to Western Electric Co. for Nike Hercules research and development and modification kits, and for additional R&D in connection with the Nike-X system contract.

LTV Aerospace Corp. will get $10,709,569 for advanced production engineering for the Lance missile system. Explosives valued at $10,120,703 were ordered from Atlas Chemical Industries, Inc. and $10,004,276 was added to an existing contract held by Condec Corp. (Stamford, Conn.) for Larc V amphibious vehicles.

White Motor Co. received a $10,003,237 order for 2½-ton trucks and General Electric Co. will provide a multifunctional array radar power plant and storage batteries for Iroquois helicopters for $10,699,781.

Rehabilitation of TNT production lines at a cost of $9,526,000 will be done by Creighton, Ernst and Wallace, Nashville, Tenn., and Day & Zimmerman, Inc., Philadelphia, Pa., will receive $9,203,142 for ammunition parts. Hercules Powder Co. gained a $9,312,152 modification to an existing contract for 2.75 rocket propellant and ammunition plant maintenance, and $3,939,262 for propellant explosives. Bendix Corp. won $9,386,664 and $4,500,720 contracts for fuzes.

Fuel tank semitrailers and repair parts will be provided by The Heil Co., Milwaukee, Wis., for $8,130,881. Bell Helicopter Co. received four contracts totaling $7,985,968 for HU–1 aircraft hub assemblies, tail-boom assemblies and two UH–1L prototype helicopters. A $7,377,882 contract increment to Martin-Marietta Corp. is for development of Pershing missile components.

Harvey Aluminum, Inc. (Torrance Calif.) won three contracts totaling $6,679,592 for various ammunition cases and projectiles. Canadian Commercial Corp., Ottawa, was awarded three contracts totaling $6,326,586 for ordnance tube assemblies and 2.75 rocket warheads. Wheel-mounted 20-ton cranes were ordered from the American Hoist & Derrick Co., for $6,292,800.

Radio batteries valued at $5,579,127 have been ordered from Union Carbide Corp. American Machine & Foundry Co. gained a $5,127,106 contract and R. G. Letourneau, Inc. will get $5,125,420 for 750-pound bombs. Fruehauf Corp. received a $5,108,340 order for 5,000-gallon fuel tank semitrailers and Air Research Manufacturing Co., Phoenix, Ariz., is receiving $4,999,738 for gas turbine engines and utility sets.

Chrysler Corp. was awarded two contracts totaling $4,828,278 for M113 engines and engine containers. Southwest Factories, Inc., Albuquerque, N. Mex., is receiving $4,724,428 for trailer-type laundry units and Radio Corp. of America, $4,344,800 for radio sets and parts. An electronic cable assembly contract for $4,225,240 went to General Cable Corp.

Illuminating signals will be fur-

Army Selects ISF Leaders for Special Awards

(Continued from page 19)

West Hartford, Conn., "The Injection Iraser in Communications."

Two of the Army Superior Award winners, Robert Swift and Dennis Hejhal, also were among first-place winners of International Science Fair $100 "Wish Awards" (for procurement of a most-desired piece of scientific equipment). Beth Romanowich earned a $75 "Wish Award" and Robert Jeffcoat added a $50 ISF award.

Meritorious Award Winners (alternates for week-long all-expense-paid visits to Army in-house laboratories) are: John W. Benge, 17, Lovington (N. Mex.) H.S.; James A. Bennett, 18, Moss Point (Miss.) H.S.; Robert S. Brubaker, 17, Meeker (Colo.) H.S.; Michael J. Cenko, 17, Marist H.S., Bayonne, N.J.;

Larry Chick, 16, Meadowdale Sr. H.S., Lynnwood, Wash.; Dean G. Christakis, 17, Horace Mann H.S., Gary Ind.; Carl H. Fromer, 15, Port Richmond H.S., Staten Island, N.Y.; Henry B. Garrett, 18, Roswell (N. Mex.) Sr. H.S.; Larry E. Goad, 17, Mayme S. Waggener H.S., Louisville, Ky.;

Paul R. Herstein, 15, Holy Rosary H.S., Flint, Mich.; Allen P. Ho, 16, Arlington Sr. H.S., Poughkeepsie, N.Y.; Robert H. Roswell, College H.S., Bartlesville, Okla; Robert L. Shuler, Jr., 15, Greenwood (Miss.) H.S.; Douglas A. Simay, 15, Indio (Calif.) H.S.; Felice R. Tillman, 18, Metairie (La.) Park Country Day School.

nished by Pace Corp., Memphis, Tenn., under a $4,167,857 contract and Remington Arms Co. has a $4,-146,760 order for 7.62mm ammunition. Orr and Senbower, Inc., Reading, Pa., received a $4,026,621 order for dispensing tank and pump units.

Mason and Hanger, Silas Mason & Co., Inc. is getting two contract additions of $3,964,033 and $2,393,877 for various ordnance items and maintenance. Stromberg Carlson Corp. won a $3,860,940 contract for telephone systems and ancillary items and LeTourneau-Westinghouse Co. is receiving $3,849,953 for diesel road graders.

General Motors Corp. will provide 6-cylinder engines and Sheridan tank power transfer units for $3,842,888 in two contracts. Firestone Tire and Rubber Co. received a $3,820,538 contract for high-explosive antitank projectile parts and Lockley Machine Co., New Castle, Pa., will furnish demolition kits and parts for $3,681-848. Bomb parts costing $3,446,967 will be produced by Carter Carburetor ACF Industries.

A bomb-part contract for $3,437,-230 went to Batesville (Ark.) Manufacturing Co. and Collins Radio Co., Cedar Rapids, Iowa, was awarded $3,418,191 for direction finders. Two contracts totaling $3,324,250 went to Bulova Watch Co. for fuzes. Caterpillar Tractor Co. is receiving an additional $3,250,000 to fabricate 10 pilot-model trucks. Radio sets and transceivers will be produced by Hughes Aircraft Co. for $3,118,750.

KDI Corp., Cincinnati, Ohio, received two contracts totaling $2,783,-178 for 2.78 rocket fuzes, Wagner Electric Co., St. Louis, Mo., won a $2,688,270 contract for 4.2 mortar projectiles and 40mm projectile assemblies will be made by Eisen Bros., Inc., Lodi, N.J., for $2,685,189.

Metal parts of 40mm ammunition costing $1,478,538 have been ordered from Eastern Tool & Manufacturing Co., Belleville, N.J., and Weatherhead Co., Cleveland, was awarded $2,670,-222 for 105mm projectiles. Hupp Corp. will receive $2,632,843 for 5,434 small engines. Bomb dispenser assemblies produced by the Merz Engineering Co., Indianapolis, Ind., will cost $2,617,140. Standards Products Corp., Cleveland, is being awarded $2,537,-068 for M114 personnel carrier track sections.

Kennedy Van Saun Corp., Danville, Pa., won $2,528,940 for 4.2 mortar projectiles. Engines and containers will be provided by Continental Motors Corp. for $2,425,000 and $2,411,986 has been added to a U.S. Rubber Co. contract for explosives and support services.

A $2,218,159 contract for basic research in surveillance processes was awarded to Stanford Research Institute and Fairchild Camera & Instrument Corp. won a 3-year buy contract of $2,212,233 for Nike Hercules electron tubes. Stelma, Inc., Stamford, Conn., received a $2,016,-900 contract for telephone-telegraph terminals.

Other contracts: Amron Corp., Waukesha, Wis., $1,971,384 for 40mm cartridge cases; Belock Instrument Corp., College Point, L.I., N.Y., $1,968,000 for Hawk simulator trainers; Cutler-Hammer, Inc., Deer Park, N.Y., $1,900,000 for radar sets, battery assemblies, field maintenance and test kits;

Hughes Tool Co., $1,800,000 for armament subsystems; Johnson Furnace Co., Bellevue, Ohio, $1,793,710 for 1½-ton cargo trucks; United Aircraft Corp., $1,790,000 for CH-54A helicopter components; Temco, Inc., Nashville, Tenn., $1,771,997 for artillery illuminating shells; Grand Machining Co., Detroit, $1,751,680 for 81mm mortar fin assemblies;

Borg Warner Corp., $1,690,000 for 20mm cartridge belts; Allison Division of GM, $1,656,935 for various types of transmissions; Burroughs Corp., $1,600,000 for automatic message processing system; Lehigh, Inc., Easton, Pa., $1,599,066 for 2.75 rocket warheads; Stevens Manufacturing Co., Edensburg, Pa., $1,572,829 for ¼-ton cargo trailers;

Carnegie Institute of Technology, $1,564,000 for research in language programing; Gibbs Manufacturing & Research Corp., Janesville, Wis., $2,750,520 (two contracts) for rocket fuzes; Mack Trucks, Inc., $1,536,405 for tractor truck axle sets; Standard Winding Co., Newburgh, N.Y., $1,529,560 for radio amplifiers; Hamilton Watch Co., $1,526,932 for mechanical time fuzes;

Eureka Williams Co., Bloomington, Ill., $1,510,620 for bomb fuzes; Industrial Metal Fabrication Co., Newark, N.J., $1,500,280 for ammunition shipping and storage containers; American Manufacturing Co., Fort Worth, Tex., $1,476,300 for 2.75 rocket warheads; Marathon Battery Co., Wausau, Wis., $1,447,688 for radio batteries; Action Manufacturing Co., Philadelphia, $1,443,606 for 90mm antitank projectile fuzes and $1,218,800 for 81mm mortar fuzes;

Motorola, Inc., $1,440,000 for radar data receiving and transmitting sets; Burgess Battery Co., $1,416,780 for radio batteries; Albion (Mich.) Malleable Iron Co., $1,386,180 for projectile body assemblies and $1,169,-015 for warhead metal parts; General Time Corp., $1,373,716 for 2.75 rocket fuzes; Champion Co., Springfield, Ohio, $1,340,623 for bomb dispenser shipping and storage containers; Airport Machinery Corp., Martin, Tenn., $1,319,050 for warhead metal parts;

Sonetronics, Inc., W. Belmar, N.J., $1,306,371 for headset microphones; National Lead Co., Pottstown, Pa., $1,300,063 for bomb body assemblies; Hamilton Watch Co., $1,296,841 for 2.75 rocket fuzes; Specialty Electronics Development Corp., Glendale, N.Y., $1,284,083 for telephone sets;

Kisco Co., Inc., St. Louis, $1,273,702 for artillery cartridge parts; Tridea Electronics Co., S. Pasadena, Calif., $1,250,000 for radio beacons and ancillary items; Baldwin Electronics, Inc., Little Rock, Ark., $1,225,115 for 2.75 rocket motors; Colt's Inc., $1,224,000 for M-16 and XM16E1 rifle magazines;

Pratt & Whitney Aircraft Division, United Aircraft Corp., $1,210,000 for components for manufacture of model engines for CH-54 aircraft; REDM Corp., Wayne, N.J., $1,210,000 for 81mm mortar fuzes; Wilkinson Manufacturing Co., Fort Calhoun, Neb., $1,192,400 for 81mm mortar fuzes; IT&T Corp., $1,063,320 for audio-frequency amplifiers;

I. D. Precision Components Corp., Jamaica, N.Y., $1,144,000 for 81mm mortar fuzes; New Mexico State University, $1,117,223 cost reimbursement contract for data reduction and computer services; Federal Laboratories, Inc., Saltsburg, Pa., $1,096,949 for hand grenades;

Gibralter Manufacturing Co., Port Huron, Mich., $1,069,160 for 15,565 combat vehicle wheel sprockets; Columbus (Ohio) Milpar & Manufacturing Co., $1,164,900 for 81mm mortar fuzes; Guenther Manufacturing Co., Buchanan, N.Y., $1,060,460 for 18,703 cargo parachute releases.

Maremont Corp., Saco, Maine, $1,130,664 for M60 machineguns, and barrel and bipod assemblies; Boyertown (Pa.) Auto Body Works, Inc., $1,097,278 for various types of van bodies; Continental Motors Corp., $1,091,197 for multifuel engines for the 5-ton truck; Bunker Ramo Corp., $1,088,322 for a universal map compilation system; Flare-Northern Division, Atlantic Research Corp., $1,031,-723 for bomb case and fuze assemblies.

Universal Industries, Inc., Chicago, $1,018,750 for telephone terminals; Sylvania Electronics Products, Inc., $1 million for electronic equipment; Conductrom Corp., Ann Arbor, Mich., $1 million for classified research and development.

'New Breed' at MICOM Enhances Helicopter Weaponry

Infantrymen in the modern U.S. Army are still the foot soldiers who slog it out in the muck and mire of combat in many environments, except that they go faster to where the action is, thanks to important advances in armed helicopters.

A new breed of missilemen at the U.S. Army Missile Command, Redstone Arsenal, Ala., is concerned with developing firepower systems for the helicopters bringing a new kind of operational capability to Viet Nam.

Armed with a wide variety of missile and rocket systems as well as conventional weapons, helicopters are giving Infantrymen mobility and firepower undreamed of a few years ago. This air mobility permits the commander to apply firepower and manpower in the most critical areas of the battlefield when urgently needed.

Providing the troops with many of these weapons is the high-priority task assigned to the MICOM missilemen. Although MICOM does not actually manufacture hardware, it does conduct extensive research in all areas of missilry, including helicopter armaments, in the R&D Directorate labs.

MICOM research includes basic investigations as well as exploratory and advanced development studies of future missile systems. Testing and reliability evaluations of equipment in the field also are scheduled by MICOM.

Col Cyril D. Sterner, Land Combat Commodity manager, and William C. Rotenberry, deputy manager, direct the Aircraft Weapons Program at the Missile Command. Col Nelson Lindstrand, Jr., is project manager for all aircraft weapons at the U.S. Army Materiel Command, Washington, D.C.

Among the helicopter armaments developed or managed by MICOM are

Col Cyril D. Sterner

the XM–3, M–22, XM–26 and the XM–158.

One of the real Army work horses, the XM–3 is a rocket-pod launching system which holds and fires 48 of the 2.75-inch rockets, 24 on each side of the helicopter. Rockets can be fired singly or in ripples at a rate of six pairs per second.

Basically an area target weapon, the system can be used defensively for protection of the helicopter against all types of ground fire, or offensively as a general support weapon.

With MICOM's Ground Support Equipment Laboratory and the Test and Reliability Evaluation Laboratory working on a crash basis, the XM–3 system was started in 1961 and finished in late 1962. It is deployed in Viet Nam.

In many cases, existing ground weapons have been modified for use on helicopters. MICOM performs the basic work required to meet management needs. One example is the French-developed SS–11 antitank missile system.

Adapted for helicopter use by MICOM and renamed, the M–22 is a subsystem consisting of a boom assembly on each side of the helicopter which mounts three launchers with missiles on each boom. The system is effective against armored vehicles and other hostile targets.

Guidance is accomplished by a gunner-operated control stick which transmits signals along a wire link. Upon firing, the gunner visually guides the missile to the target.

Another example is the XM–26, being developed to replace the M–22. The XM–26, a subsystem which fires TOW (tube-launched, optically-tracked, wire-guided) missiles, will provide much greater accuracy. It will have a stabilized sight which counters movement of the helicopter, enabling a gunner to keep a tank or other hard-point target in sight.

MICOM conducted an intensive evaluation of two stabilized sights before selecting the TOW version.

The XM–158 is a lightweight rocket launcher which also fires the 2.75-inch rocket. Unlike most other launchers, which have limited reusability, the XM–158 features a 7-tube reusable pod. In tests at the Missile Command, the launcher has fired more than 500 rounds without significant repair.

Lighter, less expensive and requiring less logistic support than similar launchers, the XM–158 pod can be used with a variety of other helicopter armaments.

The development program was completed two months ahead of schedule by MICOM's Ground Support Equipment Laboratory.

Looking to the future, MICOM missilemen are demonstrating the feasibility of adapting the 4.5-inch rocket to the UH–1B helicopter. In keeping with the Army's "shoot and scoot" requirements, missilemen are investigating advanced guidance techniques, such as the development of missiles that can lock on and guide themselves to the target without the gunner staying in the loop.

In addition, TOW guidance and control equipment will be provided for the armed helicopter project AAFSS (Advanced Aerial Fire Support System). Now under development, these helicopters will be heavily armed weapons platforms capable of speeds faster than 200 miles an hour with armaments including such combinations as rockets, antitank missiles, machineguns and grenade launchers.

The new helicopters will have all-weather, day-and-night capability.

Col Sterner was assigned to

XM–3 Launching System

M–22 Subsystem

William C. Rotenberry

MICOM in 1963 as manager of the Anti-Tank/Aircraft Weapons Commodity Office. During this time he directed such systems as TOW, ENTAC and SS–11.

The office was changed to the Land Combat Commodity Office in 1965 and missile systems such as Little John and Honest John were added. The Land Combat Support System, deport to Shillelagh, Lance and TOW systems, was added in 1965.

During World War II, Col Sterner commanded the 2nd Battalion, 382nd Infantry of the 96th Infantry Division which made assault landings at Leyte in 1944 and Okinawa in 1945. His decorations and awards include the Silver Star, Purple Heart, Bronze Star with Oak Leaf Cluster, Army Commendation Ribbon, Combat Infantryman Badge and Philippine Presidential Unit Citation.

A native of York, Neb., he attended the University of Nebraska, University of Georgia, University of Maryland and was graduated from the University of Southern Mississippi with a BS degree in mathematics. He has taken graduate work at the University of Alabama.

Rotenberry is a graduate of Auburn (Ala.) University with a BS degree in chemistry, and started in missilry at Redstone in 1950. He has since signed to provide automated test sup-

XM–26 Subsystem (artist's sketch)

worked with such free-flight rocket Land Combat Support System, designed to provide automated test supsystems as Honest John and Little John and technically supervised the operations of Thiokol and Rohm and Haas, two contractor-owned plants operating at the Arsenal.

Rotenberry later worked with TOW and the Anti-Tank/Aircraft Weapons Office before assuming his present position in 1965.

Trainer Aids APG Human Factors Research

Human factors research and testing related to aircraft performance are being accomplished through use of a flight simulator at the Army Human Engineering Laboratories, Aberdeen Proving Ground, Md.

The basic instrument trainer, developed by the U.S. Naval Training Devices Center, Port Washington, N.Y., is being used by HEL aviation experts as a research and design tool to meet the need for studying and applying human engineering criteria to future aircraft operations.

Designed to represent hypothetical fixed-wing, single-place, turbo-prop aircraft in the 6,000-pound class, the simulator is playing an important part in tackling such problem areas as air-crew efficiency, effects of flight displays, psychological and physiological variables, and operational problems discovered in the field.

A wide range of navigational aids gives the system complete instrument flight rules (IFR) capabilities. The unit also contains facilities to permit human factors research in the areas of communications procedures, flight controls, simulated flight problems and other pertinent aspects of aircraft operation.

Components of the system include a control loading frame which supports and contains the hydraulic system that provides the "feel" for the flight controls of the trainer, and a cockpit motion frame, for pitch, roll and rough air. Fundamental to the system is an extensive analog computer which simulates the aircraft. The computer also provides input of flying-task variables and accurately records pilot performance.

FLIGHT SIMULATOR, a human factors research tool at the U.S. Army Human Engineering Laboratories (HEL), Aberdeen (Md.) Proving Ground, is checked out by personnel who adapted the trainer for use in the study and development of future aircraft. Pictured (l. to r.) are Julian C. Roberts, Naval Training Devices Center, Port Washington, N.Y.; William C. Miller, HEL electronics development technician, and John A. Stephens, chief of the HEL Aviation Branch.

Future plans call for incorporation of a visual simulation capability into the system. This optical subsystem will duplicate the view of the outside world as seen from the cockpit of an aircraft in actual flight. The realistic view capability will cover a range of from 2,000-feet to the surface of the earth, and will aid study of operations close to ground level.

Sergeant Firings in Hebrides

Annual readiness-firings of Sergeant ballistic missiles by U.S. Army and West German troops are scheduled to be conducted this summer from a British launch site in the Hebrides Islands off Scotland.

The 34-foot long Army missile can deliver a nuclear or conventional warhead on surface targets ranging from 25–75 nautical miles. It also is operational with U.S. forces in the Pacific.

Netherlands Agrees to Buy 100 M-109 Vehicles from U.S.

An agreement to coproduce the U.S. Army self-propelled 155mm howitzer (M–109) for The Netherlands was signed in May by the U.S. Department of Defense and The Netherlands Ministry of Defense.

Terms provide that The Netherlands Defense Ministry will purchase approximately 100 of the armored vehicles from the U.S. for approximately $14 million. The U.S.-designed gun and mount will be manufactured and installed on the vehicles in The Netherlands.

The M–109 is an aluminum-armored vehicle for all-around protection of the 6-man crew against small arms, shell fragments and flash burns. It is full-tracked, amphibious and has a cruising range of over 200 miles with speeds up to 35 m.p.h. on land and 3 m.p.h. in water.

The weapon is now in service in the U.S. Army. It is manufactured at the Cleveland (Ohio) Army Tank-Automotive Plant by the Allison Division of General Motors Corp.

Kudos

The Department of Defense Distinguished Civilian Service Award was presented May 11 to John L. McDaniel of the Army Missile Command (MICOM), Redstone Arsenal, Ala., by Dr. Johns S. Foster, Jr., Director of Defense Research and Engineering (DDRE).

McDaniel was one of six outstanding Defense employees selected this year to receive the highest award the Secretary of Defense can confer on civilians. The annual selection is based on those who have made the greatest contributions during the year to the efficiency, economy or other improvements in the operation of the Department of Defense.

The MICOM employee received the award "in recognition of the dynamic technical and managerial leadership he has provided in planning, organizing and directing major programs in research and development of rocket and missile systems."

Miss Evelyn A. Porter, Department of the Army program analyst also was a recipient of the DoD award. She was cited for "her extremely significant contributions . . . during the past 23 years."

Others receiving the DoD award were Mitford M. Mathews, Jr., assistant director for Research and Development Operations, National Security Agency; Harry Davis, Deputy Assistant Secretary of the Air Force for R&D; Dr. Peter Waterman, head of the Equipment Research Branch, U.S. Naval Research Laboratory; and Joseph S. Hoover, Deputy Assistant Secretary of Defense (Budget).

Decoration for Meritorious Civilian Service. The Army's second highest award for outstanding achievement and contributions to national defense was presented recently to Irving Appelblatt, director, Research and Development Directorate, U.S. Army Mobility Command (MOCOM), warren, Mich.

Maj Gen William W. Lapsley, CG of MOCOM, made the presentation at his headquarters.

A Federal employee for 24 years, Appelblatt has held the top civilian R&D position at MOCOM since establishment of the command in 1962. He has been responsible for the technical direction of programs in development of the Army's mobility equipment in the automotive, aeronautical and mobility support fields.

Accompanied by a medal and lapel rosette, the certificate stated, in part, that Appelblatt ". . . distinguished himself by providing outstanding leadership in U.S. Army research and development activities. He initiated and directed the orderly progress in development of new and improved mobility equipment vital to the defense of the United States. . . ."

The Legion of Merit was presented to Col Remi O. Renier, commander of the New England Division of the Army Corps of Engineers by Maj Gen Robert G. MacDonnell, Deputy Chief of Engineers.

The colonel was cited for exceptionally meritorious performance during the two years he was resident engineer for Titan III, as deputy district engineer for Air Force construction, and as deputy district engineer for Merritt Island, Canaveral, Fla. Col Renier became head of the Engineers' New England Division last February.

The Army Commendation Medal with First Oak Leaf Cluster was presented to Lt Col Lawrence R. Ligon, Weapons Division, Army Combat Developments Command, by Col Thomas O. Blakeney, CDC director of materiel at Fort Belvoir, Va.

As a Combat Developments Staff Officer at CDC from June 1962 to April 1966, he was cited for "effective participation in Quadripartite and NATO conferences on tube artillery matters. . . ." He assisted significantly in providing member nations with a clearer understanding of the U.S. Army's user requirements.

"As a direct result," the citation stated, "the proper blending of the user requirements and the technical requirements was accomplished which will provide the United States Army

ASAP Secretary Earns 'Air University Review' Award

"China—The Nuclear Theat," an article by Army Lt Col Joseph E. Fix, III, earned the author a cash award of $50 presented by General John P. McConnell, Chief of Staff of the United States Air Force.

The *Air University Review* Awards Committee judged it as the outstanding article appearing in the March-April issue of the *Air University Review*, the professional journal of the U.S. Air Force.

In July 1965, following graduation from the Air War College, Lt Col Fix was assigned to the Combat Materiel Division, Office of the Chief of Research and Development. He held this position until appointed executive secretary of the Army Scientific Advisory Panel early in May. He has 23 years of military service.

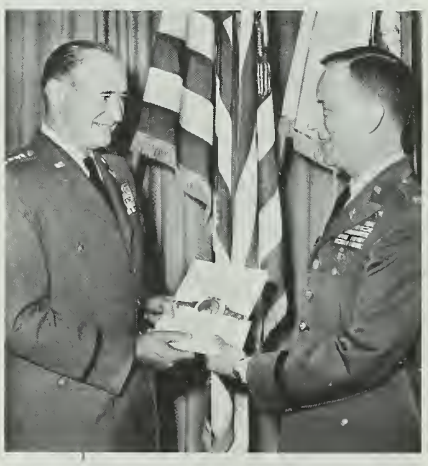
After graduating in 1945 from the Infantry Officer Candidate School at Fort Benning, Ga., he served with the 11th Airborne Division in the Philippines, Okinawa and Japan through 1947.

Other assignments have been with the 82nd Airborne Division, Fort Bragg, N.C. (1948–51); 3rd Infantry Division, Korea (1952–53); as a parachute test officer, Airborne Service Test Division, Board No. 5, USCONARC (1954–55); on staff and faculty, Infantry School (1957–60).

From 1961 to 1964, he served in Germany as G–2 Air Reconnaissance officer, Central Army Group (NATO), and later, as commanding officer, 1st Battalion, 4th Infantry, 3rd Infantry Division.

In addition to the Air War College, the colonel is a graduate of the Infantry Officers Advanced Course, Command and General Staff College, and the Armed Forces Staff College. He has a BGE degree from the University of Omaha and an MS degree in International Affairs from George Washington University.

His decorations include the Silver Star, Bronze Star, Army Commendation Medal with two Oak Leaf Clusters, Purple Heart, Combat Infantry Badge and the Master Parachutist Badge. Additionally, Lt Col Fix is an early member of the exclusive Century Club of the U.S. Army Airborne Association and has been awarded the coveted gold Master Parachutist wings of that group.



OUTSTANDING *Air University Review* article and $50 check passes from General John P. McConnell, USAF CofS, to author Lt Col Joseph E. Fix, III, executive secretary of the Army Scientific Advisory Panel.

with the tube artillery required for worldwide commitment, and at the same time insure operational compatibility with the tube artillery of our NATO allies. . . ."

Col Ligon has recently been assigned to the U.S. Army Standardization Group (UK) in London. He joined CDC in 1962.

Carl G. Davis of the Army Missile Command's Research and Development Directorate recently won the $150 first-place award, for the best paper presented at the Southeastern Regional American Institute of Aeronautics and Astronautics Student Conference.

The title of his paper is "Nonstationary Analysis Methods Applied to Antitank Missile Dispersion Computations." Under Missile Command sponsorship, Davis is attending the University of Alabama, Tuscaloosa Campus, taking job-connected courses that will lead to a master of science degree in aerospace engineering.

Prior to his present assignment, Davis served on active duty as an instructor with the U.S. Army Missile and Munitions Center and School. He holds a BS degree from Georgia Tech in aerospace engineering.

ECOM Cites Retired Army Chief Signal Officer

Special Assistant to President Johnson for Telecommunications Lt Gen James D. O'Connell (USA, Ret.), who had a major part in providing the highly dependable combat radios that helped win World War II, was honored recently for his leadership in communications.

General O'Connell, who later served as the Army's Chief Signal Officer, from 1955 until his retirement in 1959, was honored at the banquet of the 20th annual Frequency Control Symposium, attended by some 700 representatives from Government, industry and universities. The meeting was sponsored by the Electronic Components Laboratory of the Army Electronics Command, Fort Monmouth, N.J.

General O'Connell was introduced by Brig Gen William B. Latta, CG of the Electronics Command, who reviewed some of the highlights of the former Chief Signal Officer's accomplishments and presented him with a scroll.

After the groundwork of General O'Connell and his associates in developing quartz crystals for battlefield use in World War II, the Army set up a Quartz Crystal Coordinating Section under his direction; he was then a lieutenant colonel. One of the men who joined the wartime task force was W. L. Doxey, now director, Research and Development for Electronics Command.

Lt Gen James D. O'Connell (left), whose World War II work with quartz crystals helped produce combat radios, receives honorary scroll from Brig Gen William B. Latta, commanding general, U.S. Army Electronics Command.

The accomplishments of General O'Connell and his group "were fantastic," in the words of General Latta. Up to the time of World War II, the number of crystal units that had been made for all radios numbered less than 100,000, radio engineers say. By the end of the war, 70 million had been turned out through the rapid expansion of industrial production.

High DoD Award Lauds Los Alamos Lab Director

Dr. John S. Foster, Director of Defense Research and Engineering, recently presented the Distinguished Public Service Medal to Dr. Norris E. Bradbury, director of the Los Alamos (N. Mex.) Scientific Laboratory for the past 20 years. (See photo below.)

The citation accompanying the high Department of Defense award was signed by Secretary of Defense Robert S. McNamara. Dr. Bradbury was recognized for exceptionally meritorious civilian service to the Armed Forces and the United States.

The citation states, in part: "The Laboratory, under Dr. Bradbury's direction, not only developed the thermonuclear bomb, but has developed a complete spectrum of nuclear weapons for tactical, air defense and strategic weapons systems. . . . The United States is indebted to Dr. Bradbury and his laboratory, to a very large degree, for our present nuclear capability . . . ."

Attending the Pentagon award ceremony were Senator Clinton P. Anderson, (see photo below, left) chairman of the Committee on Aeronautics and Space Sciences and member of the Joint Committee on Atomic Energy; Dr. Glenn T. Seaborg, (see photo below, second from left) Atomic Energy Commission chairman; and high-ranking military officials.

CO of AVLABS Graduates From Harvard AMP Course

Col John L. Klingenhagen, commanding officer, U.S. Army Aviation Materiel Laboratories, Fort Eustis, Va., was graduated May 13 from the 49th session of the Advanced Management Program (AMP) conducted by the Harvard University Graduate School of Business Administration.

About 160 business executives, Federal Government and military leaders participated in the 13-week program to prepare mature administrators to assume the responsibilities of top management in their sponsored organizations. They represented 29 states, Washington, D.C., Canada and 11 foreign nations.

Since its inception in 1943, almost 6,000 men and women have participated in the AMP, the Nation's oldest senior management development program conducted by a university.

Army Dental Research Aims to Keep Soldiers Action-Fit

Research in Army Medical Service laboratories is directed primarily at keeping the American soldier physically fit for action, with minimal loss of time away from duty due to sickness or injury—by the best possible medical care and the most advanced methods of preventive medicine to avoid infection or disease, under environmental conditions in any part of the world. Army medical progress, however, has had a vast impact upon the civilian population in the United States and the community of nations.

Walter Reed Army Institute of Research in Washington, D.C., is world-renowned, but many other Army Medical Service laboratories are performing scientific investigations of profound medical significance. This is the first in a series of articles that will appear in this publication to explain the missions of these laboratories, a few of the major problems with which they are dealing, and some of their more notable achievements.

Pride of service of the American soldier is solidly entrenched in the knowledge that he, as an individual, is a vital part of a team whose accomplishment of a military mission is directly dependent upon how well he does his job.

Advanced weaponry and modern warfare have not lessened the importance of the individual soldier; rather, they have magnified his role because of the tremendous increase in firepower he carries, his mobility, and the part in a team effort for which he is specially trained and prepared. This is particularly true in limited warfare special operations.

Related to this role of the individual soldier and his importance to his unit, the mission of the U.S. Army Institute of Dental Research (USAIDR) assumes its proper significance. Of great importance to military operations is the fact that the largest number of casualties due to oral injuries and diseases occur among Infantry riflemen.

The oral cavity is extremely vulnerable to military injuries and diseases which cause great losses of manpower from duty. It is mandatory that these losses be reduced to a minimum. This is the mission of the USAIDR, basically, but the results of its research programs are more far reaching.

Modifications and applications of civilian practices of dentistry have resulted in improved military practices. Still the urgency to attain and maintain levels of oral health that will keep soldiers combat-ready for appreciable periods of time, and to give expeditious treatment to injuries, calls for new concepts.

The purpose of this article is to highlight the research programs and role of the United States Army Institute of Dental Research in supporting the national interests in the oral health of military forces who are prepared to live and fight in all environmental extremes of the earth.

ORGANIZATION AND MISSION. USAIDR was established in January 1962, as a Class II activity of the U.S. Army Medical Research and Development Command and is located at Walter Reed Army Medical Center, Washington, D.C.

Under the Office of the Director, the Institute is organized into Departments of: Pathology, Oral Biology, Dental Materials and Preventive Dentistry.

Included on the staff, in addition to specialists in the clinical specialties of dentistry, are military and civilian scientists qualified in the areas of pathology, biochemistry, microbiology, pharmacology, radiation biology, epidemiology, physiology and nutrition.

Col George H. Timke, DC
Director, USAIDR, WRAMC

As the Army's major agency for dental research, the U.S. Army Institute of Dental Research has as its mission:

- To conduct research in the etiology, *prevention* and control of oral disease.
- To develop simplified techniques which will allow rapid and effective dental treatment to include *maxillofacial* injuries.
- To conduct investigations on the physical and chemical properties of dental materials and the effect of manipulation and other variables on these properties.
- To conduct education and training programs in dentistry for the maintenance of high professional treatment standards.

PREVENTIVE DENTISTRY. The ravages of dental and other oral diseases need to be corrected and controlled during the period that inductees become battle-ready soldiers prepared for duty throughout the world. This will continue to be a staggeringly heavy treatment requirement of the U.S. Army Dental Corps until nationwide civilian practices of preventive dentistry provide a greater conservation of oral and dental structures.

The normal progress of science in the civilian agencies and the National Institutes of Health will produce some of the answers needed in the Armed Forces in the treatment of masses of patients.

An urgently demanding requirement exists for research and development in the Army because of the large disparity between the oral health of the soldiers and the means historically available to ready soldiers for combat.

This disparity is brought into sharper focus when one considers counterinsurgency campaigns and limited warfare, in which small groupments of men wage battles important to our Nation in areas isolated from definitive, sophisticated treatment facilities.

The morbidity rates for sick call for preventable oral maladies constitutes a medical catastrophe; each day the equivalent of a division of men, 10,000 to 15,000, undergo outpatient dental care. USAIDR studies conducted during two large scale field exercises held in 1964 showed a projected annual rate for emergency dental conditions of 184 per thousand men per year.

Even this does not fully illustrate the magnitude of the problem, because the exercises did not last long enough for cases of acute diseases or oral soft tissue to reach maximum rates. A similar epidemiology study, now under way in Viet Nam, indicates a higher prevalence rate is to be expected, on the order of 300 per 1,000.

Since World War II, and recently through the U.S. Army global programs of preventive dentistry practice and research, there has been a confluence of research rewards, bringing

a realization that completely effective oral health for masses of men is a distinct probability within the foreseeable future.

USAIDR scientists estimate, that within our lifetime, preventive dentistry, improved patient and practice management techniques, and advances in the science of dental materials, will make losses from duty for routine dental treatments nearly negligible compared to present standards.

In its studies, the USAIDR uses the interdependent combination of the controlled population groups, definitive record systems of the U.S. Army, special field teams, its own exceptionally skilled staff of scientists and consultation with other laboratories.

ORAL SURGERY FOR COMBAT CASUALTIES. The percentage of oral and maxillofacial injuries has increased in every armed conflict of this century. For example, in World War I the percentage of soldiers entering the U.S. Army's medical chain of evacuation with oral and maxillofacial injuries was 5 percent; in the Korean conflict, 9 percent; in Viet Nam, 15 percent, according to a pilot study under USAIDR technical coordination.

The excellent functional and esthetic results from oral surgery observed in fixed installations are the product of complex, time-consuming, definitive procedures, requiring many professional personnel. When oral surgery is to be performed in field medical units serving highly mobile ground combat forces, the needs for simplified surgical procedures and for improved triage and evacuation methods become extremely important.

In USAIDR's searches for expeditious modes of treatment and control of oral injuries, it is emphasized that for the most effective care possible the basic life sciences that govern the physiology of the oral cavity must be understood.

CLINICAL RESEARCH on chemical adhesives is conducted by Lt Col Surindar N. Bhasker (left), chief of Oral Pathology and Lt Col Joseph Frisch, periodontist with the USAIDR.

Interdisciplinary approaches and collation of research resources with the professions of medicine and dentistry by USAIDR's staff seek early clinical and battlefield application of research results.

USAIDR's scientists collaborate with a maxillofacial science research team at Letterman General Hospital to bring their combined talents to bear upon the specific problems of growth and repair of osseous and soft tissues within the environment of the oral cavity.

SIMPLIFICATION OF FIELD TECHNIQUES. Intensive investigations are being undertaken of the traditional methods of performing clinical dentistry, of the techniques used in laboratories, of utilizing ancillary personnel, of keeping records and of administration of group practices.

The objective is to force the evolution of practice management, physical sciences and engineering concepts that are available to dentistry in the ceaseless effort to bring the highest quality oral health care to the greatest number of soldiers.

U.S. Army-sponsored research in physical properties of dental materials began several decades ago. It has resulted in standard items which have become banners of excellence for international dentistry.

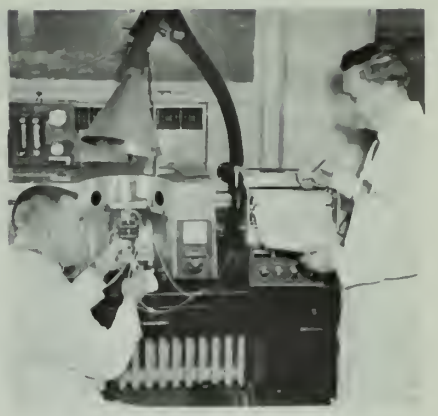
Continuing studies by USAIDR are directed to modern battlefield requirements for the manipulations and uses of various materials in environmental extremes. As a result, several important applications have been made and accepted in clinical field practices.

Strides in improving dental laboratory processing techniques are being made, and have already resulted in savings in materials and manpower.

USAIDR recognizes the continuous need for new dental materials and laboratory techniques, oriented to combat service support, and for research to exploit the bonuses of knowledge from biological and physical sciences.

Closely allied with these programs in dental material and simplification of field dental techniques is a continuous cognizance by USAIDR of the blending of biological and physical research with the emerging new generations of field equipment. Lightweight, rugged, dependable field equipment is necessary for the military dentist to support combat troops in the scattered, remote and isolated battlefields of the future.

Civilian technological improvements will always be incorporated in the oral health equipment; but the ground combat forces' Dental Corps needs evolutionary, simple equipment that provides maintenance-free reliability under the shocks of air drops and extremes of temperature and humidity. This type of equipment development is followed closely by USAIDR.



ANALYZING SAMPLES of teeth for presence of trace elements on atomic absorption spectrophotometer are Dr. Gino Battistone (seated) and Maj Francis A. San Filippo.

EDUCATION AND TRAINING. In addition to its primary research mission, the Institute has a secondary mission in the areas of graduate and postgraduate education. In conjunction with Georgetown University, a 9-month graduate course in Advanced Theory and Science of Dental Practice is conducted each year to prepare selected Dental Corps officers for advanced clinical or research training.

Postgraduate education consists of eight 1-week courses presented annually, covering all fields of specialized dental practice to make the latest scientific information available to Dental Corps officers. Annual attendance at these courses has been averaging nearly 1,000 military and civilian dentists and physicians.

Educational missions of the Institute are a logical extension of the functions of an organization devoted to mission-oriented research. The ultimate objective of all the research undertaken is improved health and capability of Army personnel.

Much of the information developed through research in the health field is of no practical value until it is communicated to practicing clinicians. Further, by participating in educational programs, the researchers are exposed on a continuing basis to the operational needs of the U.S. Army.

ACHIEVEMENTS. Though the USAIDR is a young organization, the

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Army Dental Research Keeps Soldiers Action-Fit

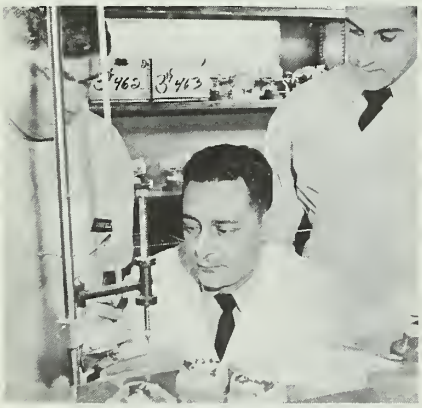
(Continued from page 27)

accurate blending of missions, personnel and resources has resulted in an impressive array of achievements, including:

- Modifications in the management of Army clinical dentistry following demonstration of improved oral health among members of a study group receiving treatment emphasizing prevention, as compared to a control group.
- Recommendations for diagnosing and treating various oral lesions, and for simplified techniques to treat nonvital teeth.
- Development of experimental vaccines for controlling dental caries.
- Demonstration of the rapid rate of deterioration of the health status of oral soft tissues of troops in the field, with recommended methods for preventing this.
- Development of oral health education programs, designed on the basis of scientific evidence to motivate military patients to take better care of their oral health.
- Development of Army-wide oral exfoliative cytology programs using simplified diagnostic techniques.
- Development of a simplified procedure for the management of periodontal surgical wounds.

Completion of biologic testing of root-canal filling materials and periodontal pack materials.

- Definition, through field epidemiology studies, of the preventable oral and dental problems encountered in combat training situations.
- Pilot studies of new chemical tissue adhesives for instantaneous apposition of tissues and the control of hemorrhage.



USAIDR PROSTHODONTIST Maj Anthony R. Fico (center) is designing prosthodontic cases tested through use of special chrome cobalt material.

As an indicator to the scientific successes of the activities at USAIDR, during the calendar year 1965, 21 papers and a textbook revision were published by staff members. Seventy-five lectures were delivered on an invitational basis outside of USAIDR to civilian and military scientific groups. Twelve abstracts were presented at the March 1966 meeting of the International Association of Dental Research; this was the largest number from any Federal agency.

FUTURE CHALLENGES. The nature of the operational requirements of the U.S. Army Dental Corps will continue to force the supporting military dental research to the forefront of the sciences. Present and planned projects include:

1. Definition of problems involved in repair and management of wounds of oral and facial tissues. The questions under exploration include determining the combined effects of oral tissues, secretions and microorganisms as affected by complex injuring agents and subsequent complications; and seeking rapid acting and recovery, short duration regional and general anesthetics for use in oral surgery under combat conditions.

Continuing studies will be in the following subjects of direct interest to combat in Viet Nam—sterilization of the oral cavity; alloplastic materials for intraoral restorations; simplification of oral surgical field evacuation techniques; rapid, positive retention of maxillofacial fractures by revolutionary means; development and perfection of intraoral bandages.

2. Exploring and developing techniques, methods and materials for decreasing oral diseases and injuries. The questions under exploration are means to eliminate or control, on a mass application basis, oral and dental diseases such as Vincent's infection, carious lesions, erythemia multiforme, herpetic viral lesions and the factors that predispose to periodontoclasia.

Continuous studies will be in the effectiveness of the Army Preventive Dentistry Program; periodontal health of Infantry and air assault units in combat and combat training; oral health problems which result in loss of combat duty time; effectiveness of rice enrichment of the Armed Forces of the Republic of China; oral diseases in Southeast Asia; oral histochemical changes; new concepts of fluoride therapy; nature and prevention of calculus.

3. To develop and devise simplified

RADIATION biologist Maj John Brady studies paramagnetic resonances in irradiated calcified tissues, using electron spin spectrometer at the USAIDR.

clinical and laboratory procedures which will permit rapid and effective oral and dental treatments in the field. The questions under exploration are efficiency and management studies in rapid diagnosing, treatment planning and direct care of masses of troops; applications of new engineering techniques to laboratory production of oral appliances; and more effective utilization of ancillary personnel.

Planned within overall missions of AMEDS are continued studies in broader roles for paradental personnel; reduced number of steps in the direct patient-doctor time frame of treatments; combining and reducing the many maneuvers needed in prosthetic field laboratories through development of multipurpose materials; applying new knowledge from the engineering world to laboratory techniques.

Developing a capability in automated records; dental restorative materials with improved manipulative

MEASURING strength of a new dental cement is Maj Simon Civjan, chief, Department of Dental Materials, USAIDR. In the background is research officer Maj Thomas V. Gardner.

physiological and esthetic properties that would be stable under all environmental and field conditions; combat restorations that would be strong enough for mastication, would arrest caries, and could be easily placed in an incompletely prepared tooth; artificial denture frames to be developed from techniques oriented to field use.

SUMMARY. The objectives of the U.S. Army Institute of Dental Research programs bring effective oral health to soldiers and support them in combat. The universality of oral diseases and their critical effects on combat operations, especially in battlefields isolated from sophisticated treatment facilities, demand expanded research efforts to match the swiftening tempo of the times, paced by new concepts in military, biological and physical sciences.

Research in preventive dentistry utilizing the worldwide resources of the U.S. Army is an advancing and productive program. The excellent functional and esthetic results from oral surgery observed in fixed installations are the product of complex, time-consuming, definitive procedures, requiring many professional personnel.

When oral surgery is to be performed in field medical units supporting ground combat forces, the research projects for encouraging evolutionary advances in surgical procedures and evacuation principles have a national importance. Other studies in simplification of laboratory techniques, dental materials and equipment are geared to the masses of patients treated in the austere and mobile facilities of the field army.

In searching for expeditious modes of treatment and control of oral diseases and injuries in the operational atmospheres of both special and general warfare, it is emphasized the basic life sciences that govern the physiology of the oral cavity must be understood. USAIDR's interdisciplinary approaches and collation of research resources with the professions of medicine and dentistry seek early clinical application of research results.

MICOM Laser Researcher Earns Sloan Fellowship

An Alfred P. Sloan Fellowship will enable William A. Davis, Jr., an Army Missile Command scientist known for his work in Laser research, to study at the Massachusetts Institute of Technology.

The chief of the Missile Command's Special Research Projects Branch, Research and Development Directorate at Redstone Arsenal, Ala., will join about 45 other Sloan Fellows when classes begin at Cambridge in June.

Davis is the second Army Missile Command employee chosen for the honor. William V. Gudaitis, deputy director of the Inertial Guidance and Control Laboratory, was selected a year ago.

The Sloan Fellowship Program is a one-year training program designed for young executives, from private industry and Government, who have demonstrated outstanding management potential. The program qualifies the participant for a master's degree in industrial management.

Born in Sebring, Fla., Davis received his early education in Nashville, Tenn. He joined Redstone Arsenal in 1954 as a supervisory ordnance engineer in the Industrial Division. Two years later he joined the Hawk Project Office of the Army Rocket and Guided Missile Agency, and the Special Research Projects Branch in 1960.

Davis is credited with being largely responsible for the Army Missile Penetration Aids Program and the Missile Command's Laser program. Since 1961 he has conducted extensive Laser research and his efforts have been commended by the Department of the Army and Department of Defense. He won the Toftoy award in 1963 for contributions to the management of the program.

Prior to coming to the Army, Davis served for four years as a general engineer at the Charleston (S.C.) Naval Shipyard. He is a graduate of Vanderbilt University with a BS degree in mechanical engineering.

At MIT the Sloan Fellows will study a variety of subjects, including economics, labor relations, law, foreign policy, finance and taxation. In addition to the classroom work, the group will meet with top officials in industry and Government throughout the year.

One of the highlights will be a field trip to Western Europe.

Davis is a member of the American Institute of Aeronautics and Astronautics, the Association of the U.S. Army, the Masons and the Huntsville Vanderbilt Club.

William A. Davis, Jr.

DoD Publishes Glossary For Tech Data Programs

Scientific and technical terms used in the Department of Defense Technical Data and Standardization Programs are consolidated in a new glossary available also to Defense industrial activities.

Intended to provide improved communication and coordination among elements of these programs, the glossary consists mainly of definitions selected from various authoritative source documents, to be as consistent as possible with current uses.

Prepared under auspices of the Technical Data and Standardization Policy Committee by a subcommittee headed by Martin H. Weik, the glossary is consistent with the forthcoming American Standard Vocabulary for Information Processing prepared by American Standards Association.

As chief of the Systems and Engineering Branch, Scientific and Technical Information Division, Army Research Office, Office of the Chief of Research and Development, Weik also is engaged in compiling a new DoD technical thesaurus.

The glossary is based primarily on definitions prepared by the Committee on Scientific and Technical Information for the Federal Council of Science and Technology. Additional terms were taken from Report No. 4 (Documentation and Dissemination of Research and Development Results) of the House Select Committee on Government Research, Armed Services Procurement Regulations, DoD Instructions and Directives, and Army, Navy and Air Force Regulations.

Defense and industrial activities may obtain copies from the U.S. Naval Supply Depot, 5801 Tabor Ave., Philadelphia, Pa., 19120, under the title "Department of Defense Technical Data and Standardization Glossary."

SCIENTIFIC CALENDAR

5th International Symposium on Rarefied Gas Dynamics, sponsored by OAR, AFOSR, ONR and NASA, Oxford, England, July 4-8.

National Society of Professional Engineers Annual Meeting, Minneapolis, Minn., July 5-9.

Summer Power Meeting, sponsored by IEEE, New Orleans, La., July 10-14.

National Aerospace Systems Conference, sponsored by IEEE, Seattle, Wash., July 11-15.

National Ceramics Manufacturers Association, Washington, D.C., July 14-16.

5th Aerospace Reliability and Maintainability Conference, sponsored by AIAA, SAE, ASME, ASTME, AIChE, ASTM and EIA, N.Y.C., July 17-20.

1966 Annual Conference on Nuclear and Space Radiation Effects, sponsored by OCRD, ONR and Air Force, Palo Alto, Calif., July 18-22.

American Astronautical Society Summer Meeting, Denver, Colo., July (date undetermined).

Army Support of Cellular Materials, Related Plastics Technology

By Dr. Robert J. Heaston

Dr. Robert J. Heaston, Chemistry and Materials Branch, Physical Sciences Division, U.S. Army Research Office, Arlington, Va., presented this information at a recent Conference on Cellular Materials at the Natick (Mass.) Laboratories.

The conference was cosponsored by the Advisory Board on Military Personnel Supplies, Committee on Foamed Plastics of the National Academy of Sciences—National Research Council, and the Clothing and Organic Materials Division of Natick Labs.

Many military uses for cellular materials, particularly foamed plastics, have been reported in scientific literature. Among the Army's well-known activities are the "buildings in barrels" concept and its application in Camp Century, Greenland, to molded prefabricated shelters, as developed by the Army Engineer Research and Development Laboratories, Fort Belvoir, Va. Improved experimental models have been fabricated more recently for test in Viet Nam.

The Limited War Laboratory at Aberdeen (Md.) Proving Ground has been experimenting successfully with plastics in dust-suppression mats for helicopter landings and takeoffs in forward areas, free air-drop water containers for supply of troops in forward areas, and lightweight hulls for delta craft.

Self-propagating foamed-in-place materials for forming shelters have been under development at the Army Natick (Mass.) Laboratories. Foam plastics have been developed for packaging insulation of refrigerators and insulated food containers. Plastic containers for supply of water and petroleum products to troops by ground and/or air-drop have also been designed and tested.

The Plastics and Packaging Laboratory at Picatinny Arsenal, Dover, N.J., is concerned with development of plastics for packaging ammunition, weapons and fragile equipment parts.

Expedient ground-surfacing systems using plastics for military roads and airfields have been explored at the Army Engineer Waterways Experiment Station, Vicksburg, Miss. The Corps of Engineers has been generally interested in the logistics, cost and time advantages of structural plastics in permanent and semipermanent construction of all types of facilities.

The main purpose of this paper is to discuss three potential new areas where foam plastics, cellular materials, and possibly organic materials in general may find applications.

The Army is reviewing requirements for cellular materials in three areas: a research program in new permanent materials for construction, a study for the development of a mobile plastics fabrication unit, and applications of cellular materials in limited warfare. Progress and future plans in each of the above areas will be discussed.

Construction Materials and Techniques. One of the major potential long-range uses of cellular materials is for construction. The Army, through the Corps of Engineers, has a total annual civil works and military construction program in excess of $2 billion, funded by various Government agencies.

The continuing military construction portion of this effort should average about $500 million annually. This does not include the Corps' massive construction efforts such as that proposed under the Civil Works Interoceanic Canal study or the Military Construction Nike-X program. Much of this work is highly specialized in nature, with no civilian counterpart.

The Corps of Engineers has maintained a significant research activity to support its construction mission. Compared to the magnitude of the military construction and civil works effort, however, the research program has been small.

For the most part, this research has been prompted by specific and immediate needs to solve design and construction problems, though it has been recognized that a longer-range view of the requirements for construction materials was needed.

Supporting research should be performed to provide more functional and economic methods in building structures, research and test facilities, all types of storage, roads and airfields, and utilities of all types.

In answer to this need, a new Army project, "Permanent Construction Materials and Techniques," was initiated in fiscal year 1966. The objective is to

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Upon the occasion of the graduation of the seventh and last of the Heaston children from the Cotter (Ark.) High School, May 20, the first of them, Dr. Robert J. Heaston (Class of 1948), was the Commencement speaker.

The 35-year-old Dr. Heaston, assigned to the Physical Sciences Division, U.S. Army Research Office, Office of the Chief of Research and Development, Department of the Army, graduated as the salutatorian of his class.

Except for Jean Ann Heaston (Class of 1951), who married the valedictorian of the Class of 1949, and Jane M. Heaston (Class of 1950), all of the Heaston children graduated as either valedictorian or salutatorian. John Buzz Heaston is the valedictorian of the Class of 1966.

Five of the Heaston children continued their education at the University of Arkansas, where John intends to enroll this fall. Charles is scheduled to graduate in 1967 with a degree in accounting. William earned a degree in electrical engineering and James was called into military service after attending the university one year.

Dr. Heaston is the only one of the seven children to earn a doctorate. In fact, he is one of the few Cotter High School students who has gone on to win a PhD degree. Cotter is a town of about 1,000 population on Route 62 in the Ozark Mountains of North Central Arkansas, located on high bluffs at the horseshoe bend of the White River.

Graduated with honors from the University of Arkansas, Dr. Heaston was elected to a number of honorary societies and was given a graduate assistantship at the University to obtain an MS degree in chemical engineering.

Dr. R. J. Heaston

After serving as a second lieutenant in the Air Force, he entered Civil Service eight years ago when he was released from military duty. He worked three years at Wright-Patterson Air Force Base as a senior project engineer on synthesis and combustion evaluation of special fuels, earning a Sustained Superior Performance Award. He left to earn his PhD at Ohio State University.

Prior to joining the Army Research Office staff, he was with the Advanced Research Projects Agency as program manager of projects on rocket combustion, hybrid rocket propulsion systems, and military chemical defoliants.

provide new knowledge essential for permanent and semipermanent construction, under normal and hostile environments, to support demands for fixed-weapon systems, improved and extended communication centers and logistic support systems, and hardened installations.

Administratively, this new project was included with the 12 other programs on materials which support the Army exploratory development requirements for armor, fuels, lubricants, ceramics, metals, composites and electronics.

Construction materials will thus be considered as one component in the overall spectra of the requirements for Army materials.

An extensive background study planned for this project has the objective of systematically developing a long-range construction research program in five phases: Future Construction Requirements; Adequacy of Existing and Projected Technology; Current and Planned Investigational Activity (Government and Industry); Necessary R&D to Meet Future Requirements; Final Integrated 10-Year Program.

A committee of experts provided by the Building Research Advisory Board (BRAB), National Academy of Sciences, is assisting in this program development. All phases of this initial study are scheduled for completion in fiscal year 1966.

The whole Army military construction long-range program is being analyzed to consolidate construction tasks in the areas listed in Table 1. This table presents the long-range (beyond 1971) requirements for military construction in general order of dollar magnitude.

TABLE 1. (1) Structures and Support Items. (2) Research and Development Test Facilities. (3) General Storage. (4) Roads. (5) Utilities. (6) Air Field Pavements. (7) Ammunition Storage. (8) Water Supply. (9) Heat Source and Transmission Lines. (10) Power and Distribution Lines. (11) Railroads. (12) Coastal Construction. (13) Sewage and Industrial Treatment. (14) Grounds and Drainage. (15) Demolitions. (16) Electrical and Electronic. (17) Petroleum-Oil-Lubricant (POL) Dispensing. (18) POL Storage.

To support routine and specialized tasks, research needs were identified in five major construction disciplines, described as follows:

Materials for Permanent Construction. The objective of this task is to develop a basic understanding of the properties of materials for permanent and semipermanent construction purposes. New applications, formulations and fabrication techniques will be considered. Studies are now underway on potential applications of a Mobile Plastics Fabrication Unit (MOPFU), state-of-the-art of structural plastics, and fabrication equipment for field use.

Environment Isolation and Control. The objective is to provide knowledge essential for economic and functional means of protecting permanent structures, and men and machinery within permanent structures, from the effects of hostile environments. Based upon requirements identified under earlier studies, further investigations will be initiated in the propagation of ground motion from forces of vibratory (steady state) or impulse ground excitations to foundations of structures.

This will involve the study of elastic properties of a foundation as related to elastic ground motion, to propagation of ground motion away from an exciting source such as missile test stands, and to the effects upon structures of ground motion originating from external sources. Fundamental information is desired for the selection and application of materials such as cellular plastics for ground motion attenuation.

Design and Construction Techniques. This task seeks to improve design and construction concepts for permanent construction. It is concerned with: design techniques and analytical procedures; construction methods and equipment; quality control; maintenance of facilities; and planning, scheduling, and management systems.

In-house and contractual efforts will be used to develop information for design manuals and planning, scheduling and management systems. New York will be oriented to Army construction missions to formulate a scientific method for data collection and utilization for construction. The goal will be a man-machine system for design and control of construction operations.

Power Plants. This task aims to develop new knowledge essential and peculiar to military requirements in the design, operation and maintenance of fixed and floating nonnuclear power plants. More knowledge is required in the areas of hardened above- and below-surface plants, precise uninterrupted power, and system reliability and maintainability.

Experience gained in the Nike-X power plant program and other specialized defense power plants will be used to develop broad concepts for the construction, operation and maintenance of hardened, precise, uninterrupted power plant facilities.

Background information will be developed for a data collection center to support design and construction of specialized military power facilities demanding precise power delivery, special protection, a high degree of reliability and reduced maintenance.

Testing Techniques. This task will develop new tests of construction materials and of structures to assure functionality, maintainability and reliability. Efforts will be directed at minimizing the time, cost and complexity of testing operations without compromising effectiveness.

The creation of the first two tasks (Materials for Permanent Construction, and Environment Isolation and Control) demands a new look at available materials that have been neglected in military construction. Specifically, new applications of plastics and cellular materials in construction should result from these studies. The other three tasks will identify new requirements and techniques for introduction of these and other materials to the construction process.

MOPFU. In January 1966, the Office of the Director of Defense Research and Engineering authorized the Army to initiate a feasibility study of the concept of a Mobile Plastics Fabrication Unit (*MOPFU*) for exploration of plastics technology in counterinsurgency and remote-area conflict situations.

Responsibility for this task was assigned to the Corps of Engineers under the newly established project, Permanent Construction Materials and Techniques. The use of plastics in structures was given added impetus after the successful application of plastics in the Seattle Fair of 1962, and the New York World's Fair of 1964-1965.

Overall Army interest in plastics, which predates these events, was previously indicated in descriptions of some of the programs underway in several Army laboratories. These programs highlight the diversity of

(Continued on page 32)

Army Support of Cellular Materials, Plastics Technology

(Continued from page 31)

plastic materials, techniques of fabrication, and potential and proven applications.

Certainly, the programs indicate clearly that the present state-of-the-art has not yet produced the "universal plastic," and it is doubtful that such a possibility exists. The current crisis in Viet Nam and its attendant logistics problems have illustrated a potentially fertile area for the application of field processed plastics.

Lacking a universal plastic, the question of how to most efficiently satisfy many needs is raised. One approach is the development of a mobile unit, or units, capable of processing a number of plastics and of being placed in operation in a matter of several hours or less.

The MOPFU concept is aimed initially at supplying logistic needs in Viet Nam, though it could be readily adapted to other theaters with other climatic problems.

The plan-of-attack to develop concepts and a program leading to a Mobile Plastics Fabrication Unit(s) has been divided into four phases, being studied concurrently for completion by June 1966, as follows:

- Identify and evaluate the potential applications of a Mobile Plastics Fabrication Unit.
- Identify and evaluate suitable plastics, formulations, and associated environmental considerations in fabrication and use.
- Establish the type of fabrication equipment required.
- Outline a program and define future plans and directions for the development of MOPFU and its operational techniques.

In spite of the multitude of application environed for the MOPFU, the initial development unit will probably be directed towards limited output. It will be necessary to review practically the whole realm of available plastics for use in the MOPFU-foamed plastics and also rigid hard plastics.

The final selection of MOPFU materials, however, will probably be limited to reduce the complexity of the operating procedures that would be required. Fabrication techniques such as the folded plate, sprayed polyurethane, filament-wound, and foamed-in-place techniques will be considered, also molding extrusion, injection, compression, blow, rotational, and thermal forming techniques.

It is expected that the MOPFU will be a Class II engineer item, operated by engineer troops and issued as a major item of engineering equipment. The concept of mobility will also have to be further examined. It is possible that the MOPFU will have to be suitable for either ground vehicle, ship-mounting or air-drop capability.

Full consideration will be given to the potential environmental location of a MOPFU. Experience has often showed that little correlation exists between foam properties as produced in a laboratory or production plant and the properties of the same foam as produced under field conditions. This problem is probably more critical for foams than for other types of plastic products to be produced.

Assessment of all of these problem areas may result in a future plan or program for a MOPFU engineering development. The output of the study may also be used for the preparation of what is known as a qualitative materiel requirement or a small development requirement.

The need for a MOPFU has grown out of extensive consideration of the number of items of plastics in use by the field Army. For a number of years, the Army has had a very active R&D program on polymer chemistry and plastic materials. Two objectives have been the development of lighter-weight hardware and throw-away items.

Early in the investigations to evaluate MOPFU, it was learned that the Army has over 300 individual plastic items in its logistics pipeline. These and new items for plastic fabrication must be examined to determine the logistics and operational advantages for their field fabrication from plastics.

A preliminary review of the literature, visits to Army installations, and conferences with some personnel in the plastics industry have revealed some candidate materials and applications which may be explored by either foam or standard plastics technology.

Foam technology has produced buildings up to 20 feet in incremental lengths by spray-foaming over removable, reusable, inflated fabric forms, or by joining prefabricated arch-sections of sandwich construction of polyurethane foam core and fiberglass polyester resin exterior sheet laminates.

Construction of dome-shaped structures for shops and warehouses by spiral generation of polystyrene foamboard has been demonstrated. Foams have also shown some potential in protective construction, such as foxhole or underground shelters, and in attenuation of ground shock and motion in structural foundations.

For heliports in forward areas, foam technology has some potential in providing a dust-suppression mat. Low-density polystyrene and polyurethane foams can be used to provide additional buoyancy in small assault boats, life preservers, rafts and steel pontoons.

Foams may also have some application in the manufacture of decoys and producing camouflage effects. Production of such items as containers and pipe may lend itself to a MOPFU unit.

Other potential activities of MOPFU include the provision of maintenance and repair facilities for vehicle bodies, small boats and pontoons by means of fiberglass reinforced polyester resin applied by spray-on or hand lay-up techniques. Protective coatings for metal parts and equipment may be accomplished by the use of fluidized beds and spray-on coatings.

In another area, surveys of commercially available equipment for both foam and plastic technologies are underway with a view of determining their size, weight, power requirements and cost. Evaluation of this information will provide the basis for incorporation in the MOPFU.

Army Exploitation of Cellular Materials Technology. Possibilities for applications of plastics in the Army are myriad. Possibly 300 of these applications were mentioned in the previous section. It is the intent of this section to summarize briefly applications which are more in the future and are related to counterinsurgency and remote area conflict situations. These applications are also interpreted in terms of production through a Mobile Field Preparation Unit.

Table 2 summarizes a number of potential foam-plastic applications in a counterinsurgency and remote-area conflict location. This list is oriented more towards foam-plastic applications than rigid, hard plastics. However, as the rigidity and the hard-

ness of foams increase, they approach the characteristics exhibited by hard, rigid plastics. As a result, it is very difficult to say where foam applications leave off and plastics technology begins.

TABLE 2. Some Potential for Foam Plastic Technology in a Counterinsurgency and Remote Area Conflict Situation.

MOBILITY: *Unsinkable Utility Boats, *Foam Assault Boats, *Pontoons, *Minesweeper Floats, **Bridges, *Docks, *Life Preservers, *Barges, *Weapons Rafts, *Swimmer Supports, **Artificial Islands for Heliports, *Construction Fill, **Hasty Route Preparation, **Gully Fill.

PROTECTION OF THE SOLDIER AND CONSTRUCTION: *Prosthetic Devices, *Quick Personnel Shelters, *Maintenance Sheds, *Magazines/Igloos, *Caches, **Hospitals, **Water Reservoirs, *Camouflage/Deception, *Airdrop Packages, *Filters, *Cots, *Splints, *X-ray Tables, *Mattresses, *Padding, *Decoys, *Slabs and Forms, *Insulated Food Boxes, *Marking Devices.

CIVIC ACTION, PSYCHOLOGICAL WAR AND MISCELLANEOUS MILITARY: *Packaging Materials for Returning Expensive Items to CONUS, *Refugee Shelters, Pacification and Housing, *Schools, Hospitals, Pagodas, *Fishing Boats, *Sheds, **Bridges, *Rafts, *Docks, *Life Preservoirs, *Cold Storage Units, Insulaton, Antenna, Plotting for Energy Absorption, Earphone Pads.

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*Immediate Possibility for Application.

**Possibility after one- or two-year RDT&E.

The characteristics which make foamed plastics of benefit to the applications described are buoyancy, resiliency, insulation qualities, void-filling characteristics, and structural rigidity. These properties are interpreted in Table 2 in terms of structural characteristics, mobility or flotation advantages, special benefits to the individual soldier, and benefits in civic action or psychological warfare.

Because of the extensive number of applications that would be possible in a counterinsurgency and remote area conflict situation, attention would eventually have to be given to utilizing the indigenous raw material resources of the areas where the applications are used. Otherwise, an extensive logistics requirement would be needed to continue MOPFU operation.

Most of the applications indicated in Table 2 are for passive purposes. It is also quite possible that foamed plastics could be used for active devices such as foamed explosives, a foam thrower, or a sticky foam for use as an intrusion barrier.

Army interest in cellular materials does not end with plastics and organics alone. Other cellular materials might be made from metal. It is not unlikely to consider that a cellular metal structure would be of value, for instance, as a porous electrode in a battery or fuel cell.

The desirability of having a porous metal structure, versus a porous or cellular plastic structure, would be mainly in terms of the advantages that the metal would hold—in terms of environmental stability, greater rigidity, a requirement for porosity, or the need for an increased surface area.

The porosity would be the factor that would be of value in the above mentioned applications. There could also possibly be the need for the surface-area factor for the purpose of catalytic activity in electrodes or in structures requiring some form of gas decomposition, such as in a gas generator.

Foamed structures have even been considered in solid rocket-propellant grain structures. Another advantage of a foamed metal structure would be lowered weight with essentially the same rigidity or structural strength.

Because of end-use advantages they offer, the Army also maintains an active interest in support of programs on syntheses of new cellular materials, the mechanism of foam formation, and novel applications of foam substrates.

It is significant to note that the characteristic of the material being a foam or cellular is often secondary to why an investigation is being conducted. For this reason, it is very difficult to analyze, to determine and to evaluate the total Army effort that might be related to cellular and foamed materials.

Acknowledgment. The author wishes to thank Lt Col Louis G. Klinker, Chemistry and Materials Branch, Physical Sciences Division, Army Research Office, Office of the Chief of Research and Development, Department of the Army, and Fanning M. Baumgardner, Advanced Technology Branch, Engineering Division, Office of the Chief of Engineers, for advice and information used in this presentation. Information also was obtained from the Plastics Technical Evaluation Center (PLASTEC).

Merger of SMC With AMC Announced Effective July 1

(Continued from page 1)

ment and support of materiel to meet requirements of the field forces."

Under the reorganization of the Army in 1962, the Supply and Maintenance Command was established as a separate major subcommand of AMC.

In the past four years, the merger announcement stated, the SMC "has succeeded in establishing a new, unified, efficient supply and maintenance organization, marked by simplified and standardized systems and procedures, an overall personnel reduction of 23,000, and a reduction in the number of Army depots from 34 to 20."

Recent establishment of the Military Traffic Management and Terminal Service, which assumed command of Army ports and terminals, further decreased the complexity of SMC's responsibilities to a point where its elimination as a separate AMC major subcommand became feasible.

Consolidation will be facilitated by a physical regroupment accomplished last year. Under this previous action, staff elements of the two headquarters were relocated to bring together elements performing similar functions.

In the earlier move, organizational integrity of the two headquarters was preserved. Under the new action, they will be combined into a single organizational entity.

Elements of the consolidated headquarters will continue to be located in Building T-7, the Nassif Building, and the Naval Weapons Plant, Washington, D.C.

Although personnel reduction was not a primary purpose of the consolidation, approximately 30 authorized personnel spaces will be saved through the merger, principally in higher grade supervisory positions.

Since personnel actions will be phased over a 6-month period, and since both headquarters have been operating below authorized strength ceilings, it is anticipated that this personnel reduction will be achieved through attrition and reassignment of individuals to jobs as nearly comparable to their present positions and grades as possible.

'Top Man in New Breed of Military Specialists'

Ordnance Expert Continues as Voluntary Researcher

At 64, George Burling Jarrett, Jr., is starting over again to apply voluntarily his internationally renowned knowledge of world weaponry in further research to improve ordnance for the U.S. Army.

As "curator emeritus," he will continue to serve the Aberdeen Proving Ground (Md.) Ordnance Museum, after retiring recently as a Civil Service employee. The retired Army Reserve colonel will be working among many ordnance pieces he contributed, and will be available as adviser "when needed."

George Burling Jarrett, Jr.

Interest in war trophies and guns was aroused in Jarrett at the age of five when his grandfather's Civil War pistol and accouterments became playthings. The lad's enthusiasm never lagged. Years of research and study of arms gave him a knowledge so vast that many famous writers and researchers sought his aid.

Distinguished military writer Arch Whitehouse in a 1959 book, *Tank*, described him as ". . . top man in a new breed of military specialists; a technical intelligence expert who knew more about the world's armament than any man—in or out of uniform."

Pulitzer-Prize novelist James Michener, who unsuccessfully combed Europe for information in German armored logistics for a World War II novel, was told by an officer in Turkey that *one* man would surely know: Jarrett did.

The Civil War "collection" Jarrett had as a little boy became a hobby. By 1930, the 28-year-old man—who also possessed business acumen — opened a museum of weapons, ammunition, uniforms and World War I fighter planes on Atlantic City's Steel Pier. During the next 10 years, more than nine million visitors paid to see his collection.

Jarrett was commissioned in the Army Reserve in 1927 and ordered to active duty at Aberdeen Proving Ground in 1939. A collateral duty for the young officer was curator of the APG museum. From his personal collection, he added some 9,000 items to the museum, making it one of the most extensive collections in the Army.

Jarrett was assigned in 1941 as ammunition adviser to the British forces in North Africa. He won the British Order of the British Empire and Legion of Merit awards for his role in helping defeat Germany's Rommel, "The Desert Fox."

Jarrett had recognized what no one had before — that captured German and Italian ammunition could be converted for use in British weapons. He improvised workshops in the field to make the changes.

In his North Africa role as adviser and trouble-shooter, Jarrett deactivated unexploded enemy bombs as a "pasttime." He also alerted Allied Intelligence to Hitler's copper shortage when he discovered the German's were using steel for shell casings.

In 1943, Jarrett was reassigned to APG. He was a lieutenant colonel then, in charge of the foreign materiel branch where he worked until war's end. Then he became civilian curator of the museum.

After a full life devoted to ordnance research, George Jarrett is still on hand to help advance Army ordnance and to share his knowledge as an older but still "top man in a new breed of specialists."

Comparative Pathology Registry Established

A new Registry of Comparative Pathology will serve as a central facility from which physicians, dentists, veterinarians and other scientists can obtain comparative pathology materials and information on species ranging from invertebrates to man.

Established at the Armed Forces Institute of Pathology (AFIP) in Washington, D.C., the registry was formed through the American Registry of Pathology. Dr. Robert Wissler, vice president of Universities Associated for Research and Education in Pathology, Inc. (UAREP), is main investigator.

Administered by UAREP, the registry is being assisted by a grant from the National Institutes of Health. Lt Col Floris M. Garner, VC, chief of AFIP's Veterinary Pathology Division, is the registrar.

To augment materials already available at AFIP, contributions will be received from primate research centers, medical and research centers, zoos, veterinary and human pathologists.

Materials pertaining to wild animals have been received from the Washington National Zoo, game preserves in Uganda, Krueger National Park in South Africa, and from Thailand. Avian materials are being received from the Migratory Animal Pathology Survey in the Pacific.

Brig Gen Joe M. Blumberg, AFIP director, said there is an increasing interest in comparative pathology and the need for accumulation of better materials on which research and training can be carried out, adding:

"The availability of a central source for consultation purposes for unusual disease conditions in diverse species is an important national resource. In the development of laboratory research, there are increased needs for providing facilities pertaining to experimental animals, including their natural and induced diseases. We should be constantly on the search for species especially suited to carry on particular studies of disease."

Information on contributions may be obtained by writing to The Director, Armed Forces Institute of Pathology, Washington, D.C. 20305, ATTN: Registry of Comparative Pathology.

Lt Col F. M. Garner

Anatomist Association Picks 2 MRL Doctors as Members

Dr. Edward Donati and Dr. Russell Reiter of the Medical Research Laboratory (MRL), Edgewood Arsenal, Md., recently were elected to the American Association of Anatomists.

Dr. Edward Polley, chief of the Neurology Branch at MRL, was joined by Dr. Norman Sulkin of the Bowman Grey School of Medicine, Winston-Salem, N.C., in proposing Dr. Reiter and by Dr. Joseph Figge, University of Maryland Medical School, in his nomination of Dr. Donati.

Dr. Reiter is an experimental endocrinologist at the MRL and Dr. Donati is a biophysical cytologist.

Army Announces 15 Selections For R&D Achievement Awards

(For photos of other winners and names of Army in-house laboratories with which they are associated, see pages 8 and 36. Story begins on page 1.)

(9) James J. Murray, director, and (10) Dr. Sudhir Kumar, associate director of the Engineering Sciences Division, U.S. Army Research Office-Durham, N.C.; (11) Jerry L. Reed, (12) William J. Nolan and (13) Elmer V. Merritt, a team from the U.S. Army Aviation Materiel Laboratories, Fort Eustis, Va.; (14) Edward L. Chambers, (15) Clyde A. Clark, (16) William H. Fischer, Jr., (17) John P. St. Clair, (18) Mylon Merriam, (19) John C. Daly and (20) Robert J. Houston, a 7-man team from the U.S. Army Map Service, Army Corps of Engineers, Washington, D.C.

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Army Announces 15 Selections For R&D Achievement Awards

(For photos of other winners and the Army in-house laboratories with which they are associated, see pages 8 and 35. Story begins on page 1.)

(21) Edward A. Gillis, project engineer in the Advanced Power Sources Branch, Electrical Power Division, U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.; (22) Milton Cutler, chief of the Advanced Development Division, U.S. Army Limited War Laboratory, Aberdeen Proving Ground, Md.; (23) Maurice Codell, Pitman-Dunn Research Laboratories, Frankford Arsenal, Philadelphia, Pa.; (24) Allan M. Biggar, research engineer, Harry Diamond Laboratories, Washington, D.C. (25) Dr. Leon W. Saffian, Process Engineering Laboratory, Picatinny Arsenal, Dover, N.J.; (26) Charles Knapp, supervisory chemist, Pyrotechnics Laboratory, Picatinny Arsenal.; (27) Dr. Peter W. Lampert, chief of the Experimental Neuropathology Section, Department of Pathology, Washington, D.C.; (28) William J. Kenneally, U.S. Army Avionics Laboratory, Fort Monmouth, N.J.; (29) Walter S. Vikestad, (30) Donald W. Mowrer, (31) Roland G. Bernier and (32) Harry Kostiak, working as a team at the U.S. Army Ballistic Research Laboratories, Aberdeen Proving Ground, Md.

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